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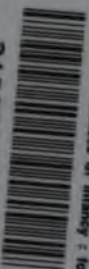
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GUIDE
TO THE
DISEASES OF INFANCY
FOR
STUDENTS AND PRACTITIONERS

BY
DR. WALTER BIRK
PRIVATE DOCENT IN PEDIATRICS, UNIVERSITY OF KIEL

*ONLY AUTHORIZED TRANSLATION AND ADAPTATION FROM
THE GERMAN*

BY
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WITH TWENTY-FIVE ILLUSTRATIONS IN THE TEXT



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PREFACE

THIS book has a purely practical aim. It is intended as a text-book for the student and as a guide for the practitioner in the treatment of diseases of infancy. With these points in view, symptomatology and therapy have been particularly considered. Theory has been indulged only in so far as is necessary for the understanding of certain disease complexes.

In the presentation of the subject-matter, I have been inspired by views which I acquired as a former assistant in the clinic of Czerny, and which I have, since then, always held.

BIRK.

FOREWORD

TO present to the American and English practitioners and students in their own language, the views held by pediatricists of part of continental Europe, was the object of the translation of Dr. Birk's "Guide to the Diseases of Infancy."

This was prompted particularly by the fact that in most of the American and English texts on pediatrics there are comparatively few references to these views,—although, in some respects, they differ materially from many held in the past.

The original text has been followed closely throughout.

FREDERIC W. SCHLUTZ.

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DISEASES OF INFANCY

PART I

INTRODUCTION

A new-born infant is said to be healthy if it is born at full term, of mature parents, and is free from definite deformities and capable of maintaining normal body temperature with the aid of good non-conductors of heat (Czerny—Keller).

The signs of maturity in the new-born are as follows: A length of about fifty centimeters, a weight of about 3,250 grams; the cranial bones firm and closely joined; the hairs of the head from three to four centimeters in length; lanugo hairs only over the shoulders; the cartilages of nose and ears firm and of cartilaginous consistency; the finger-nails well formed, firm, horny, and reaching to the finger-tip; and also, in the male child, the testicles in the scrotum.

The body weight of the new-born infant varies within wide limits. Boys are heavier than girls; children of later birth, from a given mother, weigh more than her first or second born. Infants who subsequently develop manifestations of exudative diathesis, frequently are of strikingly low initial weight.

THE NUTRITION OF THE HEALTHY INFANT

The normal food-supply of the infant is at the breast of its mother, the natural method of feeding. Not infrequently, breast-feeding is impossible. In place of it, cow's milk (or goat's milk) is given. This is called foreign, or artificial, feeding.

If natural feeding is replaced only in part—one, two or three meals of artificial food being given—it is described as dual milk feeding (*allaitement mixte*). Natural feeding, with few exceptions, produces a good and satisfactory gain in weight of the child. Many infants gain excellently on artificial food, but along with this success come many failures. For this reason, it is the duty of the physician to insist, whenever possible, upon natural feeding, even though the lactation period should prove to be very short. Experience has taught us that artificial feeding is more readily and safely carried on in those infants who have received breast-milk, if only for a period of two or three weeks, than in those who are artificially fed from the beginning.

I. NATURAL FEEDING

The new-born infant expresses no immediate desire for food. Placed in its crib after birth, it generally falls into a deep sleep, lasting for hours. If it awakens, it is only necessary to change the diaper. It will then continue to sleep. Not until the following day is the initial sensation of hunger proclaimed by loud crying. This characteristic behavior of the infant justified the custom of withholding nourishment of any sort for the first twenty-four hours. Only in cases of exceptional restlessness is catnip or black

tea, sweetened with saccharin given in teaspoonful quantities.

On the second day the infant is put to the breast. This is best accomplished by having the mother turn partially toward the side to be nursed, placing the baby's body parallel with hers and applying its mouth to the nipple. Many infants at once seize the nipple and suckle without the least difficulty. In others, this is accomplished less easily. They cry and resist, and cannot possibly be induced to take hold of the nipple. In such cases continued and persistent effort must be made, the infant being placed at the breast every four hours.

The quantity of the milk yield during the first few days is small, varying from five to twenty grams at each feeding. Slowly it increases, until about the third day, then the moment arrives when the milk "comes in."

If the infant is left to its own inclination, it will demand food at regular periods at about four hours' interval.

In course of time the feeding of the healthy infant may be arranged so that it is placed at the breast every four hours—in the morning at six and ten o'clock, in the afternoon at two and six, and in the evening at ten o'clock, or in five daily periods. No food is given during the night. Until the baby has accustomed itself to sleeping through the night, weak tea or water may be given with a spoon. The quantity in the individual meal is generally determined by the baby itself. The normal infant falls to sleep at the breast when it is satisfied.

The average duration of a feeding is twenty minutes; it should never exceed one-half hour. The use of the breasts should be alternated, at one period the

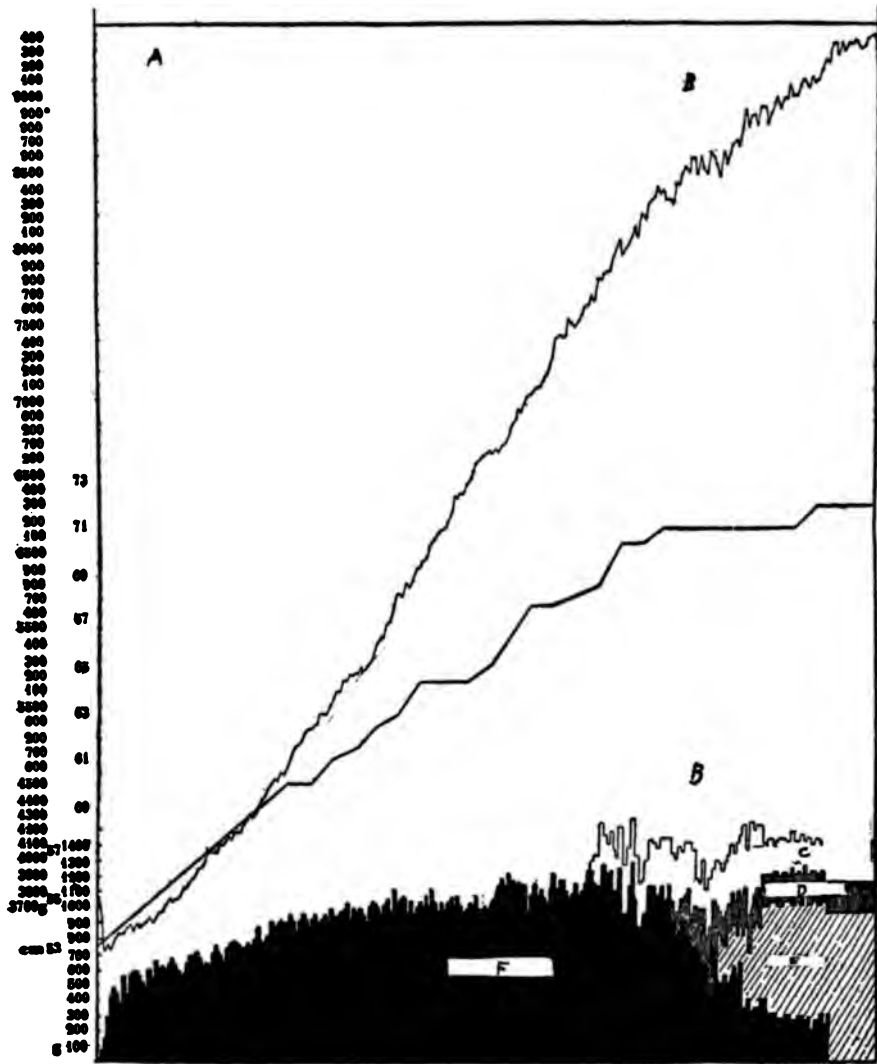


FIG. 1.—DEVELOPMENT OF THE NORMAL BREAST-FED INFANT.

The food volume is indicated in grams at the bottom of the chart. The daily variations in the volume taken are apparent. The straight-line curve indicates the longitudinal growth, the serrated line the weight curve. A, development of the normal breast-fed infant from birth until weaning. B, vaccination. C, cereals and vegetables. D, toast. E, cow's milk. F, breast-milk.

one breast being given, and at the next the other. This mode of feeding suffices until the baby is six months old; then additional feeding is begun.

Before the early afternoon breast-feeding, an attempt is made to give the baby some soup with a spoon. Often this is at first difficult, but, persistently attempted, is eventually successful. So soon as the infant has become accustomed to the soup, the first afternoon breast-feeding can be dropped, and is replaced entirely by the artificial feeding. To this is added, very soon, some finely minced vegetable, such as spinach, carrots, etc. From the sixth month on the infant receives breast-milk four times, and semi-solid food (soup and vegetable material amounting to some two hundred grams) once in the day.

It is essential that the semi-solid food be given with a spoon, and not from the bottle. The older the infant gets the more difficult is the initiation of spoon-feeding. In the eighth month the infant is weaned from still another breast-feeding. A forenoon or afternoon feeding is replaced with a meal of zwieback. Boiling water is poured over two or three zwiebacks, and these are fed with the addition of a little milk (about one hundred grams).

In the course of the ninth month the remaining three breast-feedings are replaced with cow's milk. If the transition from human to cow's milk should fall within the hot summer months, it is better to wait and give only the breast-milk until the heated term has passed. At the end of the ninth month the infant then receives soup with vegetable material at one feeding, soft-toasted zwieback at one feeding, and two hundred grams of undiluted cow's milk, sweetened with sugar, for the rest.

The constant feature of this form of feeding is the

semi-solid food given at the two meals. The variable feature is the milk. According to need, this may be modified or decreased in amount and replaced, in part, by carbohydrates, if the infant is constipated.

Beyond the first year, at about the sixteenth to the eighteenth month, the infant is weaned from the bottle and is fed milk out of a cup along with bread or rolls.

II. ARTIFICIAL FEEDING

If it becomes necessary to feed the new-born infant cow's milk, it is well to begin in the same way as with the breast-fed infant. No food is given during the first twenty-four hours, or possibly only a few teaspoonfuls of tea sweetened with saccharin. On the second day the infant is given the bottle. An arbitrary quantity, consisting of one-third milk with two-thirds boiled water and a scant teaspoonful of sugar, possibly totaling about thirty grams, is given. The infant is allowed to take as much of this as it likes. The food quantity, as in the breast-fed infant, is at the first very small, and in the first few days seldom exceeds ten or twenty grams at a feeding. The increase in quantity, however, is steady, so that at the end of the second week about eighty, one hundred, or one hundred and twenty grams are given at a meal.

The quantity of food given is increased, from time to time, in accord with the growing demand for it. The number of feedings, as in the breast-fed infant, should not exceed five in the twenty-four hours. The quantity of each individual feeding is best determined by the desire of the infant. In the course of time it will learn to take a definite supply, varying from one hundred and twenty to one hundred and fifty grams.

It will generally do this by the end of the first month. The food is not increased in quantity at this time, but is increased in concentration. In the second month the infant receives one-half milk, one-half water, five times a day, with a level teaspoonful of sugar added to each feeding. This food will be sufficient for some time, and is only changed if definite indications warrant it.

After the fourth month it is commonly customary to dilute the milk with oatmeal water instead of plain water. After the sixth month it is well to exchange the cow's milk feeding, near noon, for a feeding of vegetable soup. Since this would mean a diminution of the milk quantity, which is not intended, compensation is had by the greater concentration of milk in the remaining feedings. From the sixth month on the infant then receives one feeding of vegetable soup and four feedings consisting of two-thirds milk and one-third water, or oatmeal water, with a teaspoonful of sugar added thereto.

At the eighth month soft toast is added. At the ninth month the diluted milk is exchanged for full cow's milk. The feeding of the artificially fed child is similar now to that described for the previously breast-fed infant, viz., vegetable soup for one feeding, soft toast for one feeding, and full cow's milk, two hundred grams in amount, for the remainder.

It is possible, then, to arrange the infant's feeding, for the first year of life, according to the following scheme, bearing in mind, however, that this scheme, like any other, must not be followed too rigidly, but must, in the judgment of the physician, be modified from time to time to suit the individual case.

Plan of Infant Feeding

<i>Period.</i>	<i>Breast-feeding.</i>	<i>Artificial feeding.</i>
First day.	No food, or small quantities of tea or water, sweetened with saccharin.	
Second day to second month.	Five nursings in twenty-four hours.	Five meals, equal quantities of milk and water with small teaspoonful of sugar with each feeding.
Second month to sixth month.	As above.	Five meals, equal quantities of milk and water, with a level teaspoonful of sugar with each feeding.
Sixth month to eighth month.	Breast-milk for four feedings and cereal and vegetable for one feeding.	Four meals of two-thirds milk, one-third oatmeal water, with teaspoonful of sugar to each meal and one meal of cereal and vegetable.
Eighth month to ninth month.	Three feedings of breast-milk, one feeding of soft toast and one feeding of cereal and vegetable.	Three meals of two-thirds milk, one-third oatmeal water and sugar. One meal of soft toast and one meal of cereal and vegetable.
Ninth month to fifteenth month.	Three feedings of full cow's milk, one feeding of cereal and vegetable and one feeding of soft toast.	
After the fifteenth month.	One noon feeding, one evening feeding of above foods, with, three times a day, a cup of milk with bread.	

Concerning the quantity of food to be given the child, difference of opinion often obtains between physician and parent. What the former considers adequate nourishment is not sufficient in the eyes of the latter. The parent derives this opinion from the observation that most bottle-fed babies cry so soon as the bottle is empty. The parents naturally arrive at the conclusion that the infant is not satisfied.

It is true that in exceptional cases, breast-fed children are occasionally restless after nursing. The rule

is that they go to sleep so soon as they have finished their meal. The performance of the certain amount of work, which goes with each nursing event, seems to tire them. The artificially nourished baby drinks its milk with seemingly untiring enjoyment; its disposal leaves it with only the wish for more—a wish which the physician should not grant *ad libitum*.

In general, one is governed in artificial feeding by the behavior of the child, but the fact should never be lost sight of that scant nourishment is better than over-feeding. The amount of liquid food ingested daily during the first year should, as nearly as possible, not exceed one liter (quart).

If one wishes to determine how much nourishment a given child should receive, one may either calculate the number of calories necessary and decide upon the amount of nourishment from that index, or one may be governed by the fixed amounts empirically determined from clinical knowledge.

1. So far as the normal breast-fed baby is concerned, we know that it drinks a quantity of liquid in the course of twenty-four hours equivalent to about one-sixth of its body-weight (Budin's figure).

2. In the artificially fed baby, the amount of milk taken is equivalent to one-sixth of the body-weight. According to these figures, an artificially fed baby, weighing, for example, 3,600 grams, would receive three hundred and sixty grams of milk, or one-tenth of its body-weight. To this is added water (or barley-water) enough to make six hundred grams, or one-sixth of its body-weight. This amount is divided into five meals. Pfaundler has formulated the following plan for artificially fed babies between two and six months: Take one-tenth part of the baby's present weight in fresh cow's milk, add to it carbohydrate

material equivalent to one-hundredth part of the body-weight, and add water to make one liter of liquid; divide this into five meals, and at each feeding give as much of the divided amount as the child will readily take.

THE PHYSIOLOGY AND PATHOLOGY OF LACTATION

The act of suckling at the mother's breast is a function with which the infant is born. This function is governed by bilateral nerve centers, which include the motor root of the fifth or trifacial, the seventh or facial, and the twelfth or hypoglossal nerves. These centers lie neighboring to the respiratory centers in the medulla oblongata. Their basal seat explains the fact that children with acephaly or aplasia of the cerebrum can usually suckle perfectly well. The suckling action of the child takes place as follows: By a downward movement of the lower jaw a sort of vacuum is formed in the mouth cavity, and into this the nipple and its areola are drawn. With the closing of the jaw again the sphincter muscle of the mammary gland, lying in the areola of the nipple, is opened, allowing the milk to flow out.

The **tongue** takes very little part in the act of suckling. A short *frænum* of the tongue is not, therefore, a hindrance to the function.

In many women, the nursing of a child at one breast acts as a reflex stimulus to the other, and milk will trickle spontaneously from the latter.

The secretion of milk is activated or brought about by certain **stimulating bodies** (hormones), which originate in the internal secretion of the placenta, enter the blood stream, and thence exert a specific

influence upon the mammary gland. Fully as large a rôle as that of the internal secretion is played by the reflex stimulation of the glands caused by the suckling act of the child, or by the complete emptying of the breast by artificial means.

If, during labor, a great number of these so-called hormones enter the infant's blood stream, they have the same specific effect upon the mammary glands of the child, and will cause the secretion of the so-called **witch's milk**. This secretion occurs in boys, as well as in girls. Even before the birth of the infant, the physician should decide the questions whether the mother shall nurse her baby, and whether she is able to do so. To the first question much more indulgence was formerly given than is granted at the present time.

Absolute Weaning.

Weaning is advocated only in cases of pulmonary or laryngeal tuberculosis of the mother, in the event of severe, exhausting septic disease, in puerperal psychosis, and in cases of epilepsy when the mother suffers from frequent convulsions.

Hemorrhages occurring at the birth of the infant are not a usual cause for weaning the baby. On the contrary, it has been demonstrated that suckling at the breast contracts the muscles of the uterus, and in this manner favorably affects the course of the bleeding.

The mother should nurse her child, also, in the event of hereditary syphilis, since the "Wassermann Reaction" has demonstrated that the mothers of syphilitic children are themselves also syphilitic. A syphilitic infant should never be allowed to nurse another woman—as, for example, a wet nurse.

Among alleged occasions for weaning during the

course of lactation, subjective complaints by the mother, as of aching in the side, dragging pains in the breasts, or pains in the back of indefinite location, are insufficient reasons. This is also true of the reappearance of menstruation. Should well-founded suspicion arise that the mother is developing a disseminated tuberculosis, or should the mother again become pregnant, it becomes necessary to take the infant gradually from the breast. Weaning should take place during a period of two or three weeks. One feeding of mother's milk after another is to be replaced by a meal of artificial food prepared according to previously stated rules.

Absolute Inability to Nurse.

To the second question, Can the mother nurse her infant? but one answer may be given. No absolute inability to nurse an infant can be granted. An initial agalactia does not exist. Every mother produces milk. Many women, however, suffer from hypogalactia, and cannot satisfy their infants. Either the quantity of milk produced does not suffice to satisfy the child's demand, or the production of milk comes to a premature end after two or three months of nursing. Mothers of this type are not to be distinguished initially from those mothers who can readily nurse their infants.

Stimulation of the function of the mammary glands through outside means is impossible. All so-called lactagogia have but a suggestive effect.

Hindrances to Nursing.

Hindrances to nursing are found in inverted breast nipples, and in harelip and cleft palate of the child. In cases of inverted nipple, an attempt to nurse the

infant should always be made. Not infrequently the effort is ultimately successful. The infant does not drink from the nipple, but takes the entire mammary areola into the mouth. It suckles as one would suck at a sponge.

Difficulties of Nursing.

While real hindrances are seldom met, cases of difficulty in nursing are found with remarkable frequency. A knowledge of them is of great practical importance, because to the lay mind they often afford an entirely unjustified reason for substituting the breast by artificial feeding. With proper medical advice the difficulty can be overcome.

If the nursing baby has difficulty in suckling or refuses the breast entirely, the mouth cavity and nose should be carefully examined. Anomalies of the tongue, swelling of the floor of the mouth (Ranula), injuries to the mucosa of the mouth and painful sores or ulcers of the Bednar aphthæ type may be causes of refusal to take nourishment. A heavy coating of thrush may lower the irritability of the sense-organs lying in the mucous membrane, and in this manner hinder the reflex act of suckling. Breathing through the nose may be hindered by deflection of the nasal septum, or much more often by coryza, by diphtheritic exudates, or by edema of the naso-pharyngeal vault. All of these difficulties serve as temporary causes of blunted nervous sensibility, as we may look upon nursing difficulties which arise in premature infants, in those who are very ill, or who suffer with a clouded sensorium in the course of infectious disease or in alimentary toxemias. Intelligent treatment of any such recognized cause may make it possible to improve the nursing power.

Upon the part of the mother, obstacles to lactation may present themselves in the way of irregularities in the form of the nipple; as, for instance, in the case of a slightly inverted nipple or in the so-called flat nipple which rises only slightly above the surface of the areola.

An abnormally firm closure of the sphincter of the gland may result in slow delivery of milk from the breast, in contrast to the normal nipple from which it flows easily. Usually slight pressure of the jaw is sufficient to overcome the resistance of the sphincter.

Not infrequently undue pressure within the breast, from an accumulating secretion, causes the sphincter to relax and allows the milk to escape constantly in considerable quantity (galactorrhœa). The delayed appearance of milk at the beginning of lactation, and finally real diminution in the milk production, the so-called hypogalactia, should be merely mentioned here. For the *treatment* of these conditions, see page 103.

In neurotic women, a marked hyperesthesia of the nipples is occasionally noticed during the early days of lactation. In such cases, the length of the nursing period should be diminished as much as possible, say to ten or fifteen minutes. After each nursing the nipples should be painted with a 1 per cent. solution of silver nitrate, or with a 5 per cent. anæsthesin ointment applied on small pieces of lint, by means of which a certain degree of anæsthesia may be attained. It is well in these cases to allow the baby to nurse through a nipple shield.

Excoriations and **rhagades** of the nipple are caused by allowing the baby to nurse too long, or by an abnormal tendency of the mother's skin to abrade. Such rhagades give many women extraordinary pain,

while others are not seriously troubled by even deep fissures. In any case, *treatment* should be had on account of the danger of an infective mastitis.

During nursing, the rhagades at times bleed so profusely that the infant feces appear to be melanotic in consequence (melena spuria).

By way of *therapeusis*, limit the nursing period to twenty minutes; touch the cracks freely with a 1 per cent. solution of silver nitrate after each feeding; apply glycerin, and relieve the burden of the mammary glands by a suspensory bandage.

Mastitis in the nursing woman often appears, even during the week following delivery, with the accompaniments of fever, headache, and circumscribed pains in the mammary gland. The disease is generally confined to one of the lower quadrants. Tenderness, swelling, surface reddening, and hard nodular points follow. The course of these mastitides, most of them parenchymatous, is favorable. Effective support of the breast, the application of ice-bags, and the regular emptying of the breast by the nursing infant, will cause the symptoms to disappear.

Much more serious are those cases which occur later, usually about three weeks after delivery. They begin more violently, with high fever, headache, vomiting, reddening of the skin, and tumor formation which is painful to pressure. The pain is exhibited both at the seat of the trouble and in the axilla. With improper treatment, abscess formation quickly occurs, and is often followed by repetitional relapses. In these cases we have to deal with an interstitial mastitis.

The course of *treatment* is as follows: Taking no account of the pain caused by nursing, the baby is put to the affected breast every four hours, so that it

may be emptied as completely as possible. After each feeding the gland is elevated as highly as possible with a well-fitted hydropathic dressing, wet with a solution of boracic acid. Alum acetate is not desirable on account of its unpleasant taste.

Wide experience has shown that with this detail of treatment, incision of the breast rarely becomes necessary. On the contrary, when treatment has consisted in the induction of Bier's hyperemia, or when antiphlogistic moist dressings have been applied and simultaneously discontinuance of nursing has been ordered, we have time and again observed abscess formation. If abscess develops, the pus should be evacuated through radiating incisions, the wound being thoroughly drained and subsequent treatment carried out according to surgical principles. The pus generally contains the staphylococcus pyogenes aureus as the cause of the mastitis.

No form of mastitis, even with abscess formation, necessitates the weaning of the infant. On the contrary, the removal of the milk by the child and the consequent relaxation of the mammary glands, always has a favorable influence. The function of the affected breast decreases somewhat during the progress of the disease, but is soon re-established. In many cases a vicarious increase of the secretory function of the other breast occurs.

The Technic of Nursing.

In the first few days after delivery, the mother turns on her side when the child is to be fed. After the third day the mother may sit up in bed. This may be urged without misgiving. Many obstetricians not only allow their patients to sit up after the third day,

but also permit them to stand up. After the mother sits up, she may nurse the child while sitting, with one foot resting on a foot-stool, with the head of the baby resting on her forearm, while with the other hand she offers the breast to the baby and holds it in such a manner that with her forefinger she can press the breast away from the baby's nose, in order to allow its free breathing. It is well, generally, to give but one breast at a feeding, a practice which assures complete emptying. If any milk remains in the breast, it may revert to colostrum, and eventually cause the true secretion to cease. The length of the nursing period should seldom exceed twenty minutes. The infant takes the larger part, at least two-thirds of the breast content, during the first five minutes; the rest is taken slowly in the remaining time.

Should the production of milk be so great that the child cannot empty the breast, or, if the child happens to be feeble and has but little strength to nurse, or in the case of a prematurely born infant in whom the need for food is not great, it becomes necessary to empty the breast artificially after each feeding. This is best done by hand, the mother lifting the gland in her hand, allowing the hand to slip down from the periphery, and at the same time to exert pressure toward the nipple. In this way the milk is expressed.

She may also seize the breast at the junction of the nipple with the areola, thus relaxing the sphincter. The milk can then be expressed by rhythmical pressure. If another person is to express the milk, she should be seated in front of the mother and, placing her hand on the breast in such a manner that the thumb lies under the nipple and the other fingers over

it, the gland is subjected to concentric pressure, begun with the little finger, and is completely emptied.

The **breast pump** serves the same purpose. Its simplest and cheapest form consists of a glass piece widened at one end like a funnel, fitting over the nipple and the areola. The other end is furnished with a rubber bulb. By alternately and rhythmically compressing and releasing the bulb, the sucking movement of the child can be imitated. The expressed milk collects at the middle portion of the pump in a small spherical receptacle. Another very useful, but more expensive, model is the milk pump of Ibrahim. All breast pumps are at a disadvantage in the matter of cleaning. They should be rinsed out with hot soda water and put away dry.

Any special care of the breasts before delivery, with the view of producing a sufficient quantity of milk, is superfluous. Washing with alcohol, cognac and the like only makes the skin dry, sensitive and painful. It suffices to wash the breast daily with soap and water. This sort of care is sufficient also after delivery.

Before putting the child to the breast the nipple should be washed off with a small cloth dipped in boiled water. There exists among the laity a bad custom of first wetting the nipple with saliva before nursing.

After nursing, the breasts should be cleansed in the same manner, and carefully dried. If there is a tendency to soreness, glycerin should be applied to them, and they should be covered with several thicknesses of folded gauze to catch the milk which leaks spontaneously.

The food of a nursing woman should be sufficient in quantity and of generous variety. Exclusive pref-

erence for the use of any certain food—e.g., cereal and milk soups—formerly much advocated, is bad, because it frequently leads to loss of appetite.

Everything which has habitually comprised the mother's dietary, including acid materials, may be given. Practically one may leave out of consideration the influence of any given food on the milk secretion. The mother's great need of liquid can be supplied by a liter of milk daily, or through the usual alcohol-free, but carbohydrate-rich, malted drinks. In thin women, for whom one may fear the liability to become even thinner during lactation, the number of food calories may be increased by substituting for coffee milk and cream, with cocoa, sugar, malt extract, or eggs, added to it. Commonly, the nursing woman leading a quiet and regular life shows rather a tendency to grow stout than to grow thin.

Drugs which the mother may use have as little influence on the mammary secretion as does the food. Only iodin, bromin, hydrochloric acid, arsenic and salvarsan are likely to be excreted in the milk. In their excretion, chloroform, ether, morphin, belladonna and other narcotics have no effect on the infant.

Weaning.

Weaning has no untoward effect upon the mother, if it is achieved gradually and after the manner previously suggested. Difficulties may occur, however, if lactation must be terminated suddenly—as, for example, upon the death of the child. In such an event, it is best to reduce to a minimum the quantity of liquid given to the mother and to bandage the breast firmly. The strain on the skin may be lessened by rubbing it well with oil. By free administration of

Carlsbad salts and senna tea, water may be abundantly drawn from the body, and the secretion of the mammary glands thus diminished.

WET NURSING

The feeding of the infant by wet nurse is, to all intents and purposes, similar to nursing by the mother. Every wet nurse should be subjected to careful examination. Hereditary diseases, and particularly tuberculosis and syphilis (tested by the Wassermann reaction), gonorrhea, scabies, pediculosis capitis and pediculosis pubis, should be looked for.

An examination of the infant of the wet nurse should be made also, and should include not only a careful determination of its physical state, but especially a search for congenital syphilis. The capacity of a wet nurse cannot easily be judged. Soft breasts, warm to the touch, readily palpable gland tissue, distinct prominence of the veins in the skin, and erect nipples from which milk flows freely upon slight pressure of the finger, are accounted as breasts which will yield milk abundantly. A momentary fullness of the breasts is not a determining factor, since it can be brought about frequently and intentionally by temporary engorgement of the breast. The good growth and development of the wet nurse's infant is measurable evidence of the functional capacity of her breasts.

If one wishes to determine with absolute certainty the quantity of the secretion, it is necessary to empty the breast completely by hand or with the breast pump. After an interval of four hours the breasts should be again emptied, and the amount secreted during the twenty-four hours thus determined. A

chemical analysis of the wet nurse's milk is unnecessary. The microscope can at best show only the presence or absence of colostrual bodies.

If one has the choice, it is best to secure a nursing woman from a maternity hospital rather than through an intelligence office. Information of her physical state, of the possible result of a Wassermann reaction, and of the quantity of her milk supply is more easily obtained at such a place. Her age and the length of time elapsed since her delivery are immaterial. One should, however, favor women who have been delivered not less than two months, for in them the breast secretion is well established, and by that time signs of hereditary syphilis will have manifested themselves in the baby.

In all cases, and especially when a wet nurse feeds a newly born or a premature infant, it is absolutely necessary that all the milk left in the glands after feeding be emptied out, for nurses with even an abundant flow of milk lose it rapidly if their breasts are incompletely emptied. Usually within two or three weeks the secretion adjusts itself to the needs of the infant. For further consideration of the technic of the "wet nursing" of the premature infant, see pages 92 and 167.

If a wet-nursed infant does not gain, in spite of an abundance of milk, the nurse should not be blamed, but rather the child. A change of wet nurses is unnecessary.

The food of the wet nurse may be the same as that provided for other employees, but to it should be added a liter of milk. Overeating on her part is to be avoided.

As a substitute for the professional wet nurse, a nursing mother may be employed. Mothers nursing

their own infants are often willing, for a small compensation, to nurse another infant at one, two or three feedings in the day, or for a short period in the event of illness. Such women do much good by tiding a young infant over a dangerous period. Particularly are they valuable in cases where economic conditions prevent the employment of a professional wet nurse. A careful examination, and especially the determination of the Wassermann reaction, is quite impossible in these cases.

THE FOOD OF THE INFANT

The characteristic ingredients of milk, caseinogen, lactose and milk fat are never preformed in the tissues at large, or in the blood. They are specific products of the cells of the mammary gland. The milk appearing in the glands immediately before and after birth is called the first milk, or colostrum. From the adult milk, colostrum differs as follows:

I. THE COLOSTRUM

a. Macroscopically: by a peculiar lemon-yellow color.

b. Microscopically: by its content of colostrals bodies.

While the adult milk presents a homogeneous picture of small fat droplets, the colostrum shows, besides these granules of fat, large, unevenly shaped cells which, according to Czerny's observations, are leucocytes. Their purpose is to transport the fat from the alveoli of the gland where it has been secreted and has accumulated.

c. Chemically: Colostrum coagulates upon boiling

on account of the presence of globulins, the coagulation temperature of which is 72° C. (161° F.). It contains more lactalbumin and fat, but less milk sugar, while it is richer in ash, because of an excess of salts, phosphorus and sodium, than the adult milk.

Colostrum has its significance in the fact that it is adapted to the limited needs of the infant organism at the beginning of life. It offers in small quantity a relatively high proportion of albumin, fats and salts. Its peculiar composition arises from the fact that during this early period the mammary glands not only produce, but have the faculty of reabsorbing, the secretion. The leucocytes serve to carry away the fat. All conditions of engorgement in the mammary gland—as, for instance, in weaning—lead eventually to the formation of colostrum.

After about the third day following birth, the milk gradually loses its colostrum characteristics and takes on the qualities of the adult milk.

II. MOTHER'S MILK

Human milk is a thin, blue, glistening liquid. Microscopically, it presents a homogeneous emulsion of fat granules of varying size. Bacteriologically, it is essentially a sterile food. In its chemical composition it varies physiologically within wide limits. The figures in the following table are not to be taken as absolute values; instead, they merely give an approximate idea.

	Albumin.	Fat.	Sugar.	Salt.
Human milk.....	1.0	4.0	7.0	0.2
Cow's milk.....	3.0	3.5	4.0	0.7
Goat's milk.....	4.5	4.0	4.0	0.8

The proportion of water in human milk is 86.4 per cent.; of solids, 13.6 per cent. It yields 700

calories to the liter. The reaction to litmus is alkaline. The total nitrogen varies from 0.15 to 0.25. The greater part of the protein is in insoluble form, as caseinogen; the remainder is in soluble forms—lactalbumin, lactoglobulin, etc. Caseinogen is the chief ingredient of milk protein. Very probably it is formed by combination of a molecule of nucleinic acid, set free during the functional activity of the gland cells, with transuded serum, thus forming a nucleo-albumin.

The sugar of the milk is lactose, a dissacharid splitting to dextrose and galactose. Nothing is definitely known of its origin.

The fats of mother's milk differ from those of cow's milk. To some extent they are derived from fats ingested in the food. The variation of the fat content of milk, at different periods of the nursing event, is of practical importance. The first-milk, which the infant first obtains, has little fat, usually about 1 per cent. As the nursing continues, the proportion of fat grows greater, and at the end of a given feeding it may amount to as much as 6 or 7 per cent. The mineral components of mother's milk differ from those of cow's milk. The proportion of ash in the former amounts to 0.2 per cent.; in the latter to 0.7 per cent. The following table shows the relative percentage of the individual salts. In a hundred grams of ash there are:

In	K ₂ O	NaO	CaO	MgO	F ₂ O ₃	P ₂ O ₅	Cl
Human milk	30.1	13.7	13.5	1.7	0.17	12.7	21.8
Cow's milk.	22.14	15.9	20.05	2.63	0.04	24.7	21.27

Mother's milk also contains certain biologically important substances, such as ferments, alexins, agglutinins, etc.

III. COW'S MILK

Of the milk of animals, that of the cow and, possibly, of the goat, is the only kind that needs to be considered.

Cow's milk does not show as fine an emulsion of fat granules as does the human milk. The tendency to the separation of cream is pronounced. The fat rises and visibly separates into layers of cream and of skim-milk.

Bacteriologically, cow's milk is always to be considered impure. In the processes of straining, transferring from vessel to vessel, and transporting and selling, filth and bacteria, mostly saprophytic but at times pathogenic micro-organisms, such as typhoid, tubercle bacilli, etc., infect the milk. The number of germs may run especially high in midsummer, and occasionally in the springtime, when cows show intestinal disturbances, common to them when they are first put out to pasture. For this reason the demand is frequently made that the cow be "dry fed." Of much greater importance, however, is absolute cleanliness in the matter of milking. The number of bacteria in select milk, obtained under the strictest possible precautions, is about one hundred to the cubic centimeter. The average milk fed to babies contains from 2,000 to 4,000, and the average market milk between 10,000 and 100,000, or even more.

In its chemical composition, it shows the same variation as mother's milk. Practically this is of small importance, because bought milk is more or less mixed, and in this way the differences are compensated. The percentage of water is 88 per cent.; the solids, 12 per cent. It yields 680 calories to the liter;

its reaction is amphoteric, and its total nitrogen content, 0.55 per cent.

The qualitative difference between cow's milk and mother's milk concerns most importantly the protein. In the cow's milk the infant is fed upon foreign protein. In many respects its proteins show differing characteristics. Great emphasis was formerly placed on the point that cow's milk contains more caseinogen than does mother's milk, and that in coagulating it comes down in large, solid flakes. The conclusion was drawn that, because of this behavior, the casein of cow's milk was hard to digest. To-day an entirely different view is held. The dilution of cow's milk causes further differences; the addition of water lessens the possibility of the combination of acids with other substances, and thereby slows the coagulation time.

Heating lowers the acidity, causes the precipitation of the phosphates of the alkaline earths and of tricalcium phosphate, and in this way slows coagulation. At 50° C. (122° F.) the dissociation of cheese substances into casein and its base causes the formation of a membrane. At 60° C. (140° F.) the destruction of ferments and antibodies begins. The milk, overheated, becomes scorched, brown, and tastes like caramelized milk sugar.

IV. ADDITIONS TO MILK

From the earliest time it has been the custom to dilute cow's milk, and to add to it, among other things, sugar. Efforts have long been made to modify it in such a manner as to make its composition resemble roughly that of mother's milk. These efforts have met with little success. For dilution, boiled

water or gruels are generally used. Oatmeal gruel is employed very frequently. It is prepared in the following manner: Take one heaping tablespoonful of oatmeal, wash with hot water, place it on the stove in one-half a liter of cold water, and boil it over a low fire for three-quarters of an hour. The mixture is then put through a fine sieve, a little salt is added, and enough water to restore the total quantity to one-half liter. If the gruel is prepared from oat flakes, twenty minutes' boiling is sufficient.

In children over six months of age, oatmeal soup may be used instead of oatmeal gruel. One level tablespoonful of oatmeal flour is stirred into one-quarter of a liter of cold water; another quarter of a liter of water, to which a little salt is added, is put on the stove; as soon as it boils the first portion, containing the flour, is added; it is then boiled for two minutes longer and strained. Barley, rice, etc., may be substituted for the oatmeal, and white flour, rice flour, or corn meal, for the oatmeal flour.

The use of so-called infant foods, manufactured and most extensively advertised, has increased extraordinarily, but is not to be recommended. These infant foods are expensive, and their success is often doubtful. They offer no more than do the common flours. An infant who cannot be nourished with oatmeal flour or oatmeal gruel is not likely to succeed with manufactured foods. Their chief danger lies in the fact that the public often uses them, not as an addition to milk, but as a full substitute for it, and in so doing may provoke one of the worst forms of alimentary disturbance.

Of the sugars, beet sugar is used most frequently because it is the cheapest. It should not be given in too large a quantity, since it easily causes diarrhea.

Sugar of milk, not so sweet as and much more expensive than beet sugar, is also frequently used. In sick infants it is to be avoided. Malt sugar preparations are particularly serviceable.

Pure maltose is too expensive for infant feeding, but in its place one may use, for sick infants, the "Malt Soup Extract," and, for well infants, the so-called "Nährzucker" of Soxhlet or the "Nährmaltose" of Loefflund, which are dextri-maltose preparations. Bread should not be given during the first six months, but toast, rusks, or zwieback may be used. In these the starch, in the process of baking, is changed in part to dextrin. They are exceptionally useful foods for infants at this age. The plain toast or zwieback is to be preferred to the proprietary toasts or zwiebacks to which all sorts of additions are made.

The preparation of gruel for an infant of six months is as follows: Twenty grams of fine groats is cooked for one-half hour with one-quarter of a liter of weak broth, prepared from meat or bones, stirring it occasionally. The broth may be replaced with water, to which salt and a small piece of butter have been added.

Among vegetables, spinach, carrots, mashed potato, cauliflower, and, in winter, apple sauce and bananas are fed. These are finely divided into a pulp and may be given with broth. Powdered vegetables may also be used. With such feeding, the stools assume the color of the vegetable, with spinach becoming green, with carrots red, etc.

By way of preparation, a half pound of spinach is washed with cold water and is put on the stove in one-half liter of cold water, to which a little salt is added; it is boiled for twenty to thirty minutes and is then finely chopped. The water in which it has

been boiled is concentrated as much as possible; the two are again mixed together and a little butter is added.

The preparation of food for an artificially fed infant is as follows:

Good fresh milk obtained from a reliable source is boiled in a tin container, which should serve this exclusive purpose. It is brought to the boiling-point once or twice. It is then removed from the fire, the container is placed in another vessel containing cold water, which may be changed frequently to facilitate cooling, and the milk is stirred continually so long as it remains hot to prevent the formation of a film. When the milk is cooled, it is placed in the ice-box or in cold water. The latter should be changed hourly in the summer-time. In a second container the liquid for dilution (oatmeal gruel, meal soup, etc.) may be kept. At feeding-time, the cold milk is poured in the nursing bottle and in the diluting liquid and sugar is added. After the nipple has been put on the bottle, the latter is placed in warm water and when ready for use the milk should be of about the body temperature. To test its heat and flavor, a drop may be placed on the back of the hand and tasted. Some put the bottle to the eyelid and if the heat can be endured the temperature is accounted right. During feeding, the infant lies in bed. The bottle should be held for it until the feeding is finished.

In well-to-do families, the so-called Soxhlet method of preparing milk is much used. By this method, the food which the child requires during twenty-four hours is all prepared at one time. It is divided into five bottles, each of which is covered with a rubber stopper and put in a bath (the usual Soxhlet apparatus) for ten minutes. They are thus sterilized; then

cooled and kept cold. In cooling, the rubber stopper is drawn in and forms an exceptionally reliable closure. The Soxhlet apparatus is very convenient, but is too expensive for those of small means.

All forms of bottles which have a smooth inner surface and are easily cleaned are adaptable for use as nursing bottles. Those graduated in grams are preferable to those with simple division lines. Hot soda water and a bottle brush should be used for cleansing the bottle, which should then be rinsed thoroughly with boiled water. If milk has dried in the bottle it may be removed by placing sand, previously boiled, or raw potatoes, into it with some water and shaking it well.

Rubber nipples, with a hole bored in them with a hot darning needle, are generally used. Nursing bottles with long rubber tubes or glass tubing should not be used, as it is too difficult to clean them. The nipple should be boiled after each meal, or rubbed off with salt and well washed, inside and out, and then put away dry.

The conditions to be emphasized most in the preparation of food for an artificially fed infant are: an unquestionably fresh, clean milk, short sterilization, rapid cooling and constant cold after-temperature. The sterilization purports to kill all germs in the cow's milk; and the rapid cooling to a low temperature should cause the spores, undestroyed by the heat, to stop germinating. The demand for milk which is unquestionably fresh and clean is dictated by the fact that such changes as occur in milk through bacterial action are not to be removed by any amount of subsequent boiling and cooling. Experience has taught us that short sterilization, of from one to two minutes duration at 100° C. (212° F.), is more favorable than

prolonged heating for thirty to ninety minutes at a temperature of 55° C. (131° F.) to 75° C. (167° F.)—the so-called process of Pasteurization.

METABOLISM AND DIGESTION

The food of the infant must not only furnish fuel for the current demands of the metabolism of the body, but must also furnish abundant material for the demands of growth. In this, it differs decidedly from that of the adult.

The metabolic functions of the infant organism which interest us most are those which are necessary to the maintenance of the normal body temperature. Heat production adjusts itself to heat loss and vice versa. The latter means of regulation depends largely upon the surface of the body. In comparison with the adult, the infant possesses a much larger surface area. Relatively, it is two to three times greater than that of the adult. For this reason, the loss of heat is relatively high and, therefore, the demand for heat production is considerably greater.

For practical purposes, it is not customary to compute the amount of energy required by determining the surface area. That method is too complicated. The procedure of Heubner is generally followed. He uses, as a basis, the weight of the child and, as a constant, the so-called energy quotient. This represents the number of calories required for each kilogram of the body weight.

The energy quotient is dated as follows: First quarter of the first year, 100 calories; second quarter of the first year, 90 calories; third quarter, 80 calories; fourth quarter, 70 calories.

To determine the caloric value of food, the following figures are used as standards:

Protein, per gram=4.1 major calories.

Fat, per gram=9.3 major calories.

Carbohydrate (sugar) per gram=4.1 major calories.

Determined by these factors, the caloric food-values, per 100 grams, of the principal foods used in infant feeding are as follows:

	Calories
Human milk.....	70
Cow's milk.....	68
Cow's milk $\frac{1}{3}$, water $\frac{2}{3}$, milk sugar 5%..	42
Cow's milk $\frac{1}{2}$, water $\frac{1}{2}$, milk sugar 5%..	54
Cow's milk $\frac{2}{3}$, water $\frac{1}{3}$, milk sugar 5%..	65
Cow's milk $\frac{1}{3}$, gruel $\frac{2}{3}$, milk sugar 5%..	50
Cow's milk $\frac{1}{2}$, gruel $\frac{1}{2}$, milk sugar 5%..	62
Cow's milk $\frac{2}{3}$, gruel $\frac{1}{3}$, milk sugar 5%..	73
Skimmed mother's milk.....	38
Skimmed cow's milk.....	41
Whey	23
Buttermilk, with maximal carbohydrate.	72
Buttermilk, with minimal carbohydrate.	61
Protein milk.....	40
Malt soup.....	80

Concerning **infant digestion of normal food** it may be stated, first, that no anatomical or functional deficiency exists in the gastro-intestinal tract at birth. The process of digestion is generally considered to take place in the following manner: The protein, under the influence of suitable ferments, is gradually split to the amino-acids and their complex compounds, or peptids. There is no difference in this respect

between the protein of human and that of cow's milk. In both cases there must first be an extended splitting up of the protein molecule before the reconstruction of organic protein begins. The end products of the protein metabolism are found in urine, principally in the form of urea (70 per cent.), and also as ammonia, uric acid, creatinin, etc. The nitrogen in the feces is derived principally from the intestinal secretions and from bacteria, rather than from the food.

The following carbohydrates are frequently used in the infant food: (a) Monosaccharids: dextrose and fructose, either seldom employed (occasionally as fruit in older children). (b) Disaccharids: lactose, saccharose and maltose. (c) Polysaccharids: starch, dextrin, and cellulose (as found in gruels, toast or vegetables).

These carbohydrates are simply absorbed if present as monosaccharids, or are split up by the respective ferments, ptyalin, amyllopsin, lactase, maltase, or invertin. Beyond the intestinal walls, they either undergo glycolysis in the tissues or are converted into glycogen, as storage material. Any unabsorbed portion is attacked by the intestinal bacteria, undergoes fermentation and, in the form of the lower fatty acids, plays a significant rôle in maintaining a normal, and sometimes a measure of pathologic peristalsis of the bowel.

It is of practical importance to know that the marked increase of weight, often observed in high carbohydrate feeding, is by no means due to solid tissue-building, but is largely due to water retention in the tissues.

The digestion of fat in the food takes place in the following manner: The fat is first emulsified and, in turn, split. The fatty acids which result unite with

the alkali of the intestinal juices and form soaps. These are absorbed. In passing through the intestinal wall, they again give up the alkali and beyond it undergo a resynthesis to fat. A small part of the fat is found in the stools, either as unaltered neutral fat, or as free fatty acids, or as soaps of potassium, sodium, calcium and magnesium.

The digestive tract is not only the place of the absorption, but also, in a degree, of the elimination of salts. Thus, for instance, calcium, magnesium and iron are, in large part, excreted in the feces.

In detail, the course of digestion is as follows:

1. No really important change in the food material takes place in the mouth; its passage is much too rapid. Only in older infants, fed upon food in more or less solid form, does the ptyalin of the saliva have opportunity to act.

2. In the stomach, milk immediately coagulates. The casein curd is formed and separates from the whey. The latter, with a small content of lactalbumin and the greater part of the salts and sugar, quickly passes through the pylorus. The remainder is subjected to the influence of the gastric juice. The casein curd is gradually digested from the periphery of the mass. Gentle contractions of the stomach walls advance the liquified material toward the pylorus, which opens, from time to time, and allows the chyme to pass through. So long as the duodenum is filled, the pylorus remains closed. Only when the chyme has moved farther on, does the sphincter reopen and allow new material from the stomach to flow over. After a period of one and one-half or two hours in the breast-fed, and of three hours in the artificially fed infant, the stomach is empty.

During gastric digestion the protein is acted upon

by hydrochloric acid and pepsin, and finally leaves the stomach in the form of albumoses and peptones. In the pyloric end of the stomach erepsin still further breaks up the protein. Emulsified fat is split in the stomach by lipase. The sugar, in large part, quickly leaves the stomach with the whey.

3. In the small intestine, the chyme assumes a yellowish color. It is subjected to the influence of the digestive fluids, derived from the intestinal walls, the pancreas and the liver. The protein is split into amino-acids by the trypsin of the pancreas, while simultaneously the erepsin of the mucous membrane of the small intestine breaks down the peptone. Amylopsin changes starch into maltose; the maltose is in turn split by maltase; lactase breaks down the sugar of milk; and invertase acts upon cane sugar. In addition to these specific ferments, bacteria act upon the sugars. The fat is changed by steapsin into glycerin and fatty acids, the latter being saponified.

All of the end-products of digestion derived from the organic components of the food above mentioned are absorbed, together with the water and the salts.

4. In the large intestine, the absorption of water takes place. The content of the bowel now consists of small portions of food which has escaped absorption of large quantities of bacteria, of intestinal secretion, of intestinal epithelium which has been cast off, and of salts which the body has excreted. The mass of these substances is evacuated at more or less regular intervals from the intestinal tract of the child as feces. At every examination, the nature of the stool should be determined by inspection.

The character of the stool varies. In a breast-fed infant it is yellow in color, homogeneous, soft, has an acid reaction and has a slightly sour, but not

unpleasant odor. Often it contains small white particles representing fatty-soap formed from the fats; frequently these are so mixed with it that the stool appears minced. If the stool has been kept in the napkin for some time the color often changes to green. Sometimes, the stools of the breast-fed infant are, from the very beginning, colored green, and are loose and mixed with a large amount of stringy intestinal mucus. The mother's milk, with its varying amount of fat, is partly to blame for this. In part, the infant is at fault in an inherent inclination to such feces. This type of stool is not necessarily to be regarded as pathologic. In general, too much emphasis need not be placed on the examination of the stool of the breast-fed baby. If a child receives nothing but mother's milk and thrives on it, the number as well as the nature of its stools is a matter of secondary importance.

With the **artificially-fed** infant it is altogether different. An increase of stools beyond four in twenty-four hours should always be considered pathologic. The character of the stool, like that of the breast-fed baby, is yellow in color, at times acid and again alkaline in reaction, depending upon the kind of food given and on the condition of the stomach and intestinal canal of the infant. If the food is lacking in fat, such as skim milk or whey, the stool is green and loose; if the food is rich in fats (cream mixtures), it is semi-solid bright yellow and shows the fat; with malt-soup feeding, it is dark brown, etc. The so-called fatty-soap stool has a very characteristic appearance, it is well-formed, dry, free, from water, of a light gray color, almost like chalk. An abnormally liquid stool indicates a pathologic condition.

Constipation is prominent if the infant is over-fed on cow's milk (Milch Nährschaden) or is suffering from Hirschsprung's disease, etc.; or if the amount of food taken is so small that little residue is left to form feces. Pseudo-constipation is to be noted in such conditions as pyloric stenosis, under-feeding at the breast, etc.

The urine is excreted much more frequently in the infant than in the adult; about twenty to twenty-five times in twenty-four hours. The urine is almost colorless; its specific gravity is low; under normal conditions it is free from albumin and sugar.

THE PHYSIOLOGIC DEVELOPMENT OF THE INFANT DURING THE FIRST YEAR OF LIFE

If the growth of the child has not been hindered by disturbances of nutrition or by infection, no essential difference, as regards bodily or mental development, is noticeable at the end of the first year between the breast-fed and the artificially-fed infant.

During the first few days of life, the infant still bears the signs of its intimate connection with the mother. For this period it is called a "new-born." When the umbilical wound has healed, the meconium has been expelled, the physiologic weight-loss has been compensated and the amount of food taken is sufficient to cause increase in weight, then the new-born baby is considered alike in every respect to any other infant.

The weight of the body is generally used as a means of determining the degree of development of the infant, but is not sufficient fully to characterize the condition of the child. Other matters must always enter into consideration. The reliable criteria are as follows:

1. The **color of the skin**. In the new-born babe it is an intense red, due partly to the rich blood supply in the skin and partly to the oversupply of red corpuscles. Gradually the skin becomes paler, but always keeps a fresh rosy appearance. The breast-fed infant only becomes pale during illness or if nursed exclusively for abnormally long periods, a year or more. The ears, especially then, appear bloodless, pale, yellow and transparent.

2. The **mucous membranes** of the mouth cavity are pale rose in color and moist. During illness they become red, beginning first with the tip of the tongue. They soon become sticky, dry and are often covered with thrush.

3. The moisture of the skin (**turgor**) is always excellent in a healthy infant. So soon as a child becomes ill, the turgor begins to disappear and the flesh becomes soft.

4. The **immunity of the skin** forms a sure protection against chafing, even if very little care is given to its sanitary condition. If in breast-fed infants there is a tendency to chafing, cutaneous eruptions, intertrigo, or milk crust, or if seborrheic deposits show on the head, we are generally dealing with an infant affected with an exudative diathesis.

5. The **elasticity of the muscles** is best determined by palpation of the abdominal layers. Normally the infant has firm abdominal muscles lying in line with the thorax. During illness, and especially in disturbances of nutrition, the tone of the abdominal muscles is diminished and they are either collapsed or distended by intestinal meteorism.

6. Deep and peaceful **sleep** is one of the attributes of a healthy, normally developed infant. The sleeping position is such that the arms at the elbows are

thrown upward in such a way that the closed hands lie close to the ears.

7. The **subjective state** of the healthy baby is one of content, happiness and quiet. There is a happy medium of repose and agility. It notes with interest what is going on about it; and moves its arms and legs spontaneously without exhibiting the uneasiness and floundering of the nervous or sickly child.

8. A special event in the course of its development is the **teething**. In the view of the layman, this event is the cause of countless ailments. This idea is begotten of the fact that the teeth, about ready to erupt, frequently break through during the course of a fever. The layman draws the conclusion of an inverse relationship. He believes the teething to be the primary cause of the illness and the fever its ultimate result. The occurrence of "*Dentitio difficilis*" in children is justly doubted.

The time of eruption of the teeth varies in different children. In rare cases, children are born with them (*dentitio præcox*). Usually, the eruption of the eight incisor teeth takes place between the seventh and twelfth months. Frequently children have no teeth at the tenth month, although they are perfectly healthy. The teeth always erupt symmetrically.

Formula for the approximate determination of the number of teeth: $T = \text{number of teeth}$; $m = \text{age of children in months}$; $T = M - 6$ (Pfaundler).

Delayed appearance of teeth (*dentitio tarda*), with asymmetrical eruption, occurs in rickets. Dental anomalies are also frequently observed in cases of exudative diathesis, in syphilis, idiocy, spasmophilia, myxedema and mongolism.

9. A good indicator of the progressive develop-

ment of the skeletal system is given in the condition of the **fontanelle**. It steadily grows smaller and closes within sixteen months.

10. The **static functions**, standing and walking, begin to develop at the end of the second month, when the child, lying on its stomach, raises its head, for the first time, from its support. At three months, it can sit on its mother's arm and keep its head erect. At six months, it attempts to straighten out the legs; at nine months it begins to sit up in bed alone, and at the tenth or eleventh month it begins to stand up by the side of the crib. Soon after the first year it walks alone or with assistance.

11. The **mental development** depends partly upon natural and nutritional tendencies, partly upon training; i.e., upon the degree of attention the child receives. The control of its mental development is especially important, if any suspicion of idiocy exists. The first intellectual action of the child which can be controlled is the fixation of the eyes, as in the following, with the eyes of an object held before them; e.g., a burning match, a watch, or a rattle. This fixing of the eyes, which indicates that the infant can both see and give attention, is apparent at about the third month. At the same time it will begin to reach for the article held before it, thus indicating that its observation is transformed into a conscious response. A still farther advance is shown when the baby recognizes the particular article previously observed, as, for example, its bottle.

12. Its **growth in length** is of practically little importance. Only if it predicates other disturbances of development which experience shows go along with anomalies of size (myxedema, micromelia, infantilism), is determination of the length of the body

advisable, if for no other reason than to check up therapeutic success.

Usually disturbances of nutrition and the accompanying emaciation do not affect the length curve. Only where there is a prolonged cessation of gain in weight is a cessation of growth in length also observed.

13. The **weight curve** of the infant shows a steady, constant rise so soon as the physiologic weight loss, immediately following birth, has been made up. In normal children this is only rarely broken by either a temporary loss or a single day's cessation of gain. Rapid increases, alternating with temporary cessation or with pronounced losses, are generally signs of an abnormal condition in the infant.

Daily weighing of the infant is not to be recommended. It is superfluous in babies who are obviously doing well and especially so if they are breast-fed. In artificially-fed infants, a weighing once a week is sufficient. If the average gain in weight is about fifteen grams per day, it is enough, as a smaller gain than this is not always or necessarily a sign that the food should be changed, or in the breast-fed infant that supplemental feeding should be given. In many cases one should be content that the child is gaining at all. In the breast-fed infant, showing prolonged arrest of gain in weight, it is well to look for causes of the deficiency in the baby itself.

According to Finkelstein, the gain in weight of the baby should be such that at the end of the first half year its weight has doubled and at the end of the first year it has trebled. Approximately correct figures may be obtained if, during the first half year, one multiplies the months of the child's age by 600, and later by 500, and adds the sum to the amount it weighed at birth.

PART II

THE PECULIARITIES OF THE NEW-BORN INFANT

I. PHYSIOLOGIC CHARACTERISTICS

The **physiologic decrease in weight** of the human new-born is no peculiarity of the species, since it definitely occurs in other animals also and, therefore, may be justly designated as physiologic. Its cause is to be found in the fact that of the slight ingestion of food during the first few days of life, the amount of waste material given off by the body far exceeds the intake. The physiologic loss is, in the main, a loss of water given off by the skin and the lungs; the meconium, the umbilical cord and certain broken down organic substances, accounting for the lesser part of the weight loss.

The **amount of the decrease** depends upon the weight of the infant. The greater the birth weight, the greater the weight loss. According to Pies, it amounts to about 300 grams (or 9 per cent. of the body weight) in the first-born, and about 250 grams (7 to 8 per cent.) in infants of multiparæ.

The **decrease continues** for some two to five days. Then the decline of the weight-curve stops and begins to turn upward in a more or less rapid ascent. The first gain of weight may take place even if insufficient food from the caloric standpoint is given. It is due principally to retention of water as a matter of compensation for the water lost in the preceding days.

If the amount of food is entirely insufficient, or if the infant becomes ill from an infection or disturbance of nutrition, the gain in weight does not occur. After a short period of wavering, a second loss of weight ensues, which may no longer be considered physiologic and no longer consists in the mere loss of water. Instead, it is a slow breaking down of the body tissues, and for that reason is compensated with much greater difficulty.

The time within which the initial birth weight is regained varies in different cases. The loss may be made up by the tenth day. In the majority of cases, however, this does not happen. Especially with the first-born of young women of the less fortunate social classes, the birth weight is not regained until some time between the tenth and the thirteenth day of the infant's life. The factors which account for this difference in time are still unknown. At any rate those cases in which the infant gains slowly in spite of the abundant milk secretion of the mother, show very plainly that the trouble frequently lies with the child.

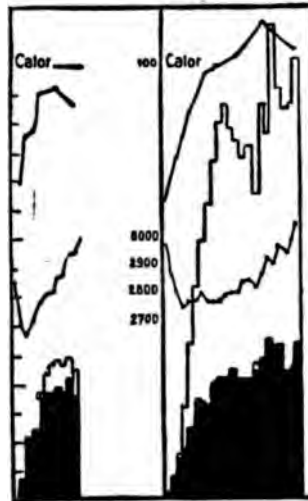


FIG. 2.—REGAIN OF BIRTH-WEIGHT.

The Feces and Urine of the New-Born.

The stool of the new-born during the first few days consists of **meconium**: a black sticky mass composed of desquamating intestinal epithelium, epidermal scales, lanugo, mucus, bile, cholesterin and hematin crystals. The excretion of meconium begins at

birth and is practically completed by the end of the second day. Later, a few stools of more liquid consistency usually follow, but they are still mucoid and of a dark green color. Only after this do the first orange-colored milk stools appear. The first meconium stool often contains a slimy grayish white mass of intestinal mucus, the so-called meconium plug.

The **urine** of the new-born baby is scanty and often very turbid. Numerous cells derived from the urinary passages are found under the microscope, their presence causing a slight precipitate to form in the urine upon the addition of acetic acid and potassium ferro-cyanide—thus producing the physiologic albuminuria of the new-born. If cylinders are found in the urine, the conditions are no longer normal. A physiologic glycosuria is also reported present in prematurely born children.

Uric Acid Infarcts.

In more than one-half of the cases examined the urine of the new-born babe contains uric acid crystals. In clear urine, these precipitate as a red-brown sediment in the test tube. They are often found in crystalline form on the diaper, or color the latter a reddish-brown. They are an indication of renal infarcts, the origin of which is not exactly known. This is commonly looked upon as a physiologic occurrence.

The infarcts appear because the new-born, in the first few days, secretes a far greater amount of uric acid in proportion to urea than does the adult. Where this large quantity of uric acid originates is not, at present, definitely known. It is the current opinion that the blood of the new-born infant contains an unusually high percentage of leucocytes. These are very soon destroyed and their nuclear substance con-

taining in their nucleo-proteins the mother substance of uric acid, the purin bases are freed. These consequently flood the organism; with the increased formation of uric acid there is a marked excretion of uric acid in the urine,—the uric acid precipitating in the form of crystals.

In older infants, an occasional renal infarct is found, but only in cases of severe and generally fatal disturbances of nutrition.

Physiologic Catarrh of Skin and Mucous Membranes.

The outer skin and the mucous membranes may manifest a "physiologic catarrh." The skin, deeply reddened at first, begins to scale more or less. On the chest entire areas of skin will frequently desquamate. With the peeling, the lanugo disappears. The hairs of the head fall out, and frequently there is only a tuft left at the nape of the neck. The catarrh of the urogenital membranes leads to the expulsion of large numbers of cells which cause the so-called "albuminuria." In girls, there is frequently a white flux from the vagina and, in some cases, this is distinctly hemorrhagic. These vaginal or uterine hemorrhages are the analogue of those occurring in the mother at the same time,—the lochia resulting from the desquamation of the genital mucosa. Severe hemorrhages occur in hemophilia and sepsis.

The Physiologic Congestion of the Mammary Glands.

In many new-born infants, boys as well as girls, a swelling of the mammary glands and a secretion of a milky fluid occur. This secretion has been designated by the laity as "Witch's Milk." After a few days, the swelling disappears spontaneously.

In order to protect the glands from chafing by the

clothing, it suffices to apply cotton pads. The midwife or nurse should be forbidden to express the milk. Should mastitis nevertheless occur, an attempt must be made to reduce the inflammation by the application of wet aluminum acetate dressings and a proper bandaging of the breast. If an abscess forms, the pus should be drained by a radiating incision.

The Umbilical Wound.

The umbilical cord contains the umbilical vein and the two umbilical arteries. The first carries the blood, during the fetal life, from the placenta to the body of the child, and especially to the liver; while the arteries, originating in the hypogastric vessels, carry the blood back to the placenta. With the establishment of the pulmonary circulation, the function of the umbilical vessels ceases and with the severance of the umbilical cord only a small portion of it remains attached to the infant's body. Nutrition of this stump is impossible, since the umbilical cord contains no vasa vasorum. It dies, dries up, mummifies, and is cast off between the sixth and tenth day, an inflammatory line of demarcation indicating the point where it separates.

The umbilical vessels within the body are the seat of thromboses and slowly atrophy to connective tissue bands. The vessel leading to the liver becomes its round ligament; the two umbilical arteries become the vesico-umbilical ligaments. Through a secondary shrinkage of the ligaments the umbilicus appears to be inverted in later life. The umbilical wound, which remains after the loss of the stump of the umbilical cord, shows a scant secretion for a few days. After this ceases, the umbilicus may be considered healed.

The care of the stump should be conducted under aseptic precautions. It should be wrapped in sterilized gauze and held in place by an abdominal gauze bandage. So soon as the dressings are soiled, they should be renewed in the same manner. During the bath, unless the bath is omitted until the cord comes off, the dressings are cut through at the back, the adhering portion being loosened by the water. The discharging wound, which remains after the cord has fallen off, may be powdered lightly with dermatol and kept covered with a bandage until it is dry. The stump of the cord should not be wrapped in cotton. It is well also to avoid the use of adhesive plaster, cambric bandages or any other bandage material which is practically impervious to air.

II. THE PATHOLOGY OF THE NEW-BORN INFANT

DEFORMITIES

Immediately after the birth of the infant, deformities should be looked for. Harelip, cleft palate, club foot, amniotic constrictions, spina bifida and similar defects are not easily overlooked. On the contrary other anomalies, as, for example, imperforate anus, opening of the rectum into the vagina, congenital heart lesions, are often not discovered for several days, and the latter condition frequently not for years.

BIRTH INJURIES

Asphyxia.

Conditions of asphyxia appear usually, in the new-born infant, in immediate connection with birth. They may, however, appear some days later in mature,

as well as in prematurely-born children; but especially the latter. They are rarely observed in older infants.

(a) Asphyxia occurring in direct connection with birth has its cause in anomalies of the act of delivery, such as weak labor pains, protracted labor, premature detachment of the placenta, compression of the umbilical cord, etc. In all of these cases, disturbances of the placental circulation is the chief factor. This causes premature stimulation of the respiratory center, which in turn brings about the premature respiratory movements of the infant. Aspiration of amniotic fluid follows and so causes asphyxia. In mild cases, cyanosis exists; in more severe cases, pallor of the skin and mucous membranes. The treatment of these conditions is the problem of the obstetrician; it is similar to methods used in all other forms of asphyxia.

(b) Should attacks of asphyxia in the new-born recur, or appear for the first time on the day following birth, there may be any one of several causes for the event. Most often they appear in the premature infant; but they may also develop in cases of malformation of the heart, the diaphragm, the lungs, or the trachea; in hereditary struma, in hyperplasia of the thymus, in white pneumonia, and from injuries of the brain produced at birth.

Diagnosis.—The causative factor is often not amenable to diagnosis in vivo. Where it is a matter of malformation or cerebral injury, the attacks develop so that, without showing any symptoms of stenosis, the child breathes more slowly and more superficially, until finally respiration ceases, at the same time cyanosis appears and the infant gradually turns a dark blue. At first, the heart is quite audible; as the cyanosis deepens its action becomes slower, but

continues for a relatively long time, until, approaching the end, only a few distant intermittent sounds are heard and the heart finally ceases to beat. If the cyanosis of the baby is noticed while the heart is still beating regularly, although slowly, it is always possible to end the attack and relieve the respiration.

If, during the course of the asphyxic attacks or coincident with them, convulsions occur of the toxic type, with opisthotonos or clonic rhythmical contractions of the extremities or the facial muscles, the assumption that a birth injury has been had, gains in probability.

In cases of struma and hyperplasia of the thymus there exists from birth an audible, coarse, at times stenotic, stridulous respiration, always accompanied by retraction of the diaphragm and almost always by abundant secretion of mucus. If the chin is brought down upon the chest, respiration becomes more difficult and, in turn, is made easier if the head is bent back. The diagnosis of hyperplasia of the thymus can be established by the X-ray.

(c) Conditions of asphyxia which develop later in infant life, chiefly occur in infants affected with la grippe or capillary bronchitis.

Prognosis.—A fatal termination and emphasizing the tendency to recurrences, the danger of asphyxia consists in the fact that it may cause or give rise to atelectasis, to aspiration (pneumonia) and to hemorrhages in different organs (pleura and liver). For this reason, the prognosis of asphyxia is never favorable.

Treatment.—Should an infant show inclination to asphyxia, it is best to place it in a hospital. In this case, care must be taken that the mother's breasts are regularly emptied so that her milk secretion is

maintained. If the child is in the onset of an attack, an attempt is made to stimulate crying, thus causing deep inspirations. This is accomplished by shaking or pinching the infant or by beating the buttocks.

If this treatment is unsuccessful and the cyanosis increases, a hot bath of 35° C. to 38° C. (95° F. to 100° F.) should be prepared and the infant placed in it. According to experienced obstetricians (Ahlfeld) all children with asphyxia who are at all viable need only be placed in warm water, when they will gradually begin to breathe normally. It is, of course, necessary to free the air-passages if they are obstructed by mucus. Direct stimuli to the skin, such as applications of cold water, are also advised, in order to obviate periods of incomplete respiration. After the attack passes and the infant again breathes well it is taken out of the bath and rubbed vigorously with a towel. This causes it to cry loudly. It is then warmly wrapped and put to bed.

In emergency, the infant may be placed in a vessel of warm water, rubbed and kneaded well; and from time to time, plunged for a moment into a second vessel containing cold water.

In most cases, hot water is not always immediately available and it becomes necessary to use other means. An old and reliable method of producing respiration is that of Schultz. In the last few years, however, so many objections to its use have been made by obstetricians that it is well only to employ it as a last resort and then with great care.

It is always proper to give a stimulant (one syringe of camphor), for in all attempts to bring back life the maintenance of heart action is of the utmost importance. The air-passages should be kept free, the tongue drawn out with a padded clamp, and all

mucus or stomach contents which may have been regurgitated removed. Artificial respiration is then attempted, either by raising the arms rhythmically, as in the adult, and again pressing them against the thorax, or by grasping the thorax of the child with the flat palm of the hands, placed along the sternum, and compressing it with gentle pressure. The hands are then quickly released so that the ribs again separate and the lungs draw in air. This kind of pressure is exerted in rapid succession, about twice as rapidly as one ordinarily breathes.

Heart massage may also be tried. The left half of the chest of the infant is grasped with the right hand and the heart region compressed periodically in rapid succession with the thumb.

Attempts to restore respiration should be continued until the movement of the heart has entirely ceased. If the treatment is successful, one may prevent the return of attacks by giving a short hot bath, followed by a cold douche, every two or three hours. This is one of the best means of preventing the development of atelectasis. An oxygen tank should be at hand and, above all, a trained nurse should be in charge of the infant day and night.

If the attack comes on at the time of feeding, a not infrequent occurrence, feeding by mouth may be discontinued entirely for one or two days. Enemas of normal salt solution and breast-milk may be given instead.

Birth Traumata.

The traumata resulting at the time of delivery lead to many subsequent phenomena. Most frequently there are small hemorrhages in the conjunctiva bulbi which are spontaneously absorbed after a few days;

more rarely, compression-necrosis of the skull is caused by pressure against the promontorium or in the use of the obstetrical forceps. Fresh or granulating wounds often result from laceration of amniotic adhesions.

More serious results of labor terminated by forceps are seen in depressions of the skull. Often they disfigure it greatly and may also injure the cranial contents. The treatment of these depressions is as follows: The depressed bone is flattened out and then raised by concentric pressure of the fingers. If this does not accomplish the desired end, an ordinary nicked corkscrew may be used to bore into the bones through the skin and then to lift the depressed portion.

The pressure upon the skull while passing through the parturient canal may cause displacement of the scalp against the bones, the blood-vessels being torn and hemorrhage resulting between the periosteum and the bones, forming the so-called cephalhematoma externum. Often it does not occur immediately after birth, but rather on the second or third day. It then forms a fluctuating, soft swelling, about the size of an egg, with distinct bony walls. Usually it is found on the parietal bones, but never passes over their edge. It is never found over the fontanelle or one of the sutures. It disappears by spontaneous absorption after eight or ten days.

The *differential diagnosis* must take into account a meningocele, which is never limited to the bones, but is always found in the interspaces between them, and which, moreover, pulsates and can be reduced. The caput succedaneum must also be considered. It usually disappears within twenty-four hours after birth.

Treatment is generally unnecessary and consists chiefly in the application of a pressure bandage. If, in exceptional cases, the hæmatoma is not absorbed in four weeks, a thin trocar may be introduced and the blood emptied through it.

If symptoms of meningeal irritation, and especially pressure symptoms, occur in connection with cephalhematoma externum, the presumption of a complicating cephalhematoma internum, caused by epidural bleeding, is justified. Fracture or fissure of the skull-bones generally occurs simultaneously with the bleeding.

Injuries to the Cranial Contents.

Any birth, even the most easy and spontaneous, may cause injury to the cranial contents. This possibility naturally grows greater in cases of difficult delivery, and especially in those which must be completed by operative assistance. The most dangerous accident is sudden compression, as in extraction by means of the forceps, in delivery of the head by the "Smellie Veit" manipulation, in delivery by vaginal Cæsarean Section, or by clumsy perineal support with pressure of the skull between the temples. Premature infants show a special disposition to brain injuries.

Symptoms and Course.—In mild cases, in which a simple compression of the skull has occurred without intracranial injury, the infant will show symptoms of compressio cerebri lasting for a short time, possibly a few hours or a day: superficial, insufficient breathing, retardation of the pulse, and absence of reflexes. After a brief period everything is normal again.

In more severe and at the same time more frequent cases post-mortem examination gives no macro-

scopic evidence of injury to the brain substance. Nevertheless, one must take it for granted that the causative trauma was very grave. The infant is born in an asphyxic state and rapidly succumbs. If it is resuscitated, it continuously shows such signs of cerebral pressure as sopor, attacks of asphyxia, retardation of the pulse, paralysis and convulsions. The majority of such cases dies during the first week of life.

In a third of the cases, hemorrhages of the brain are found at autopsy. Since these are partly caused through the agency of severe external force, they are frequently combined with fractures or depressions of the skull. In other cases, they appear without visible external injury and may occur even in spontaneous labors of smooth and rapid progress. The hemorrhage arises from small blood vessels which in the distortion of the skull in the parturient canal, as the bones overlap one another, are torn. It may arise from the sinuses if lacerations in the tentorium occur. The latter require particular attention. One differentiates: 1. Supratentorial hemorrhages which originate in the sinus sagittalis. They spread over the cerebrum and are followed by restlessness and crying on the part of the child, tenseness of the large fontanelle, pallor of the skin, paresis of the hypoglossus, etc. 2. Intratentorial hemorrhages which originate in the sinus transversus. Their sphere involves the cerebellum and medulla oblongata. During their course, the infant is peculiarly quiet, but they involve respiratory disturbances, blood discolored cerebral fluid, such prominent spinal symptoms as rigidity of the neck and bilateral clonic convulsions, with secondary cortical symptoms in the region of the oculomotorius. 3. Combination of both tentorial

forms with ventricular and spinal hemorrhages. In all forms of cerebral hemorrhage, sub-normal body temperatures have been observed, even as low as 29° C. (84° F.).

If the infant lives, the symptoms slowly disappear until the infant appears normal. Nothing definite may be known of its future fate. There are observations, however, which show that consequent to hemorrhage of the brain, hydrocephalus later developed. In other cases epilepsy is noted as a sequel.

The *prognosis* in infratentorial hemorrhages is bad on account of the proximity of the respiratory centers. In the supratentorial form it is better, because these are eventually amenable to surgical treatment.

The *diagnosis* of all brain hemorrhages is very difficult. Often, in vivo, one cannot decide whether hemorrhage exists or merely compression. Lumbar puncture does not always furnish a clue. Nevertheless, it should be done in every case. Too much spinal fluid must not be drawn off, as the lowering of intracranial pressure may cause fresh hemorrhage to occur.

The *treatment*, in most cases, must confine itself to the prevention and relief of attacks of asphyxia. This may be carried out according to the directions given above. Schultz's method should not be used if but the slightest suspicion of cerebral hemorrhage exists. To deal with the hemorrhage directly is only possible in the most favorable cases. Its position must first be determined by exploratory punctures of the cranial sutures. It may then be aspirated, or may be emptied by incisions in the region of the coronal suture.

PARALYSES

Facial Paralysis.

Facial paralysis of the new-born infant is usually brought about by pressure of the blade of the obstetrical forceps on the facial nerve. Its symptoms are the same as in adults. The paralysis often interferes with proper suckling and milk regurgitates through the nose. The injury disappears with or without treatment in a few weeks. It is customary, some fourteen days after delivery, to apply a weak faradic current two or three times a week. The eye on the afflicted side cannot be fully closed during sleep and should be covered with a pad of gauze so that conjunctivitis will not develop. The typical paralysis of delivery is:

Paralysis of the Brachial Plexus.

It occurs only in assisted or non-spontaneous births. It is caused by mechanical violence, such as pressure with the finger in the Prague method and in Mauriceau's manipulations. Pulling, in the attempt to release the head and shoulders, may result in lesions of the brachial plexus at the point of issuance of the sixth cervical nerve between the Scaleni muscles.

Symptoms.—In the so-called superior paralysis (Erb's type) the following muscles are involved: the deltoid, biceps, brachialis anticus, infraspinatus, supinator longus and brevis. The afflicted arm hangs limp, the shoulder is held higher than that of the other side, the arm rolls inward, the palm of the hands turns out, and the wrist and finger movements are free.

A rarer form is the inferior plexus paralysis (Klumpke's form) in which the lower arm, hand and

finger muscles are involved. Along with it ocular symptoms, narrowing of the palpebral fissure and myosis occur. The sensibility is intact; there is no expression of pain. The electrical examinations give no reliable data in the new-born.

Complications.—These are caused, in the main, by the same birth traumata and consist in fractures of the clavicle or separation of the epiphyses of the head of the humerus.

The *prognosis* is generally good. Recovery occurs in periods varying from two weeks to two months. Some cases, however, are refractory. In these, muscular atrophy, permanent disturbance of function, subluxations and retarded growth appear early.

In the *differential diagnosis*, fractures of the femur, demonstrable by the X-ray, acute arthritis, with fever and luetic or so-called Parrot's paralysis, responsive to the Wassermann reaction, must be considered.

Treatment.—Fixation of the arm to the trunk by means of adhesive plaster or bandage; daily exercise of the arm during the bath, moderate massage, and early treatment with electricity. The stationary electrode is to be placed over the plexus region, the other on the arm. The strength of the current used should be barely sufficient to cause a contraction. The treatment should be carried out every second day for a period of about five minutes.

Hematoma of the Sterno-cleido-mastoid.

Occurrence.—In spontaneous, as well as artificial deliveries.

Etiology.—Through a maximum extension of the sterno-cleido-mastoid muscle, a separation of the muscle fibers with consequent hemorrhage occurs. A secondary factor lies in the infection of the trauma

with some microorganism. A simple tear of the muscle does not lead to the formation of hematoma; the pathologic and anatomic picture is clearly that of an infected muscle wound (Kader, Czerny-Keller).

Symptoms.—A visible spindle-shaped swelling on the sternal end of the sterno-cleido-mastoid,—with abnormal hardness and sharp projection at the center of the muscle. Caput obstipum may develop and an inclination to torticollis is seen when there is permanent functional disturbance.

Prognosis.—Usually good, unless torticollis persists.

Treatment.—Gentle massage of the muscles, rest and fixation of the neck with a cloth binder. After absorption of the hemorrhage has been completed, an attempt is made to prevent the development of wry neck by bandaging the neck in a position of overcorrection toward the sound side.

DISEASES OF THE UMBILICUS

In pre-antiseptic times, diseases of the umbilicus played a great rôle, inasmuch as local infections of the umbilical wound not only led to manifold diseases, but in that the umbilical wound was looked upon as a port of entry for the exciting causes of general septic infection in the infant (**umbilical sepsis**).

With the beginning of the antiseptic era in obstetrics, the frequency as well as the severity of diseases of the umbilicus declined; so that to-day only such harmless forms as blennorrhœa of the umbilicus, granuloma, and umbilical ulcers are observed. All other forms have become so rare that the in-

dividual physician seldom meets with them. Views regarding the rôle which the umbilicus plays in the causation of sepsis have also changed. It is no longer considered the chief port of entry for the exciting cause of infections. At the autopsy of infants dead from sepsis, the umbilicus is found intact in the majority of cases. The possibility that sepsis should start in the umbilical wound is by no means great (Basch), although it may never be entirely ruled out. In any case, it is an assumption less remote that in cases of sepsis neonatorum, in which the umbilicus is affected, it means a secondary localization of the microorganisms of infection. Bacteria coming from the gastro-intestinal canal may enter the system and preferably localize at a near point where there is a lowered resistance dependent upon disturbance of the circulation. Such a plan and such a condition are found in the vicinity of the umbilical vessels.

ANOMALIES OF THE UMBILICAL WOUND

Normally, the skin of the abdomen extends slightly upward on the umbilical cord. The retraction of the umbilical vessels which occurs later causes this portion of skin to be drawn in, and thus the folds of the umbilicus are formed. If the continuation of the abdominal skin on the umbilicus is abnormally long, the retraction will not suffice to completely invaginate the umbilicus and a cylindrical elevation remains, the so-called CUTIS UMBILICUS. If the reverse is the case and the continuation of the skin is abnormally short, so short that the amnion even extends to the abdominal wall, the AMNION UMBILICUS is formed. Both are harmless conditions. Umbilical hernia,

urachus-fistula, and the open Meckel's diverticulum, are only interesting from a surgical standpoint.

In rare cases it occurs that the separation of the dried umbilical cord is delayed. It may remain attached to the body for weeks without any accompanying constitutional disturbance. It is well to wait from fourteen days to three weeks, when the umbilical cord should be tied with a silk ligature close to the abdominal wall and the greater part of it trimmed off with the scissors. The remaining stump is then allowed to fall off of its own accord.

UMBILICAL INFECTIONS

In place of the normal drying of the umbilical cord moist gangrene may occur if putrefactive organisms gain entrance. This pathologic process is favored by moist dressings or by those which are impervious to air, or by the application of ointments. Its presence is shown by the offensive odor given off from the umbilicus. At times a slight fever is present.

Treatment.—Discontinuation of the daily bath and dressing of the umbilical stump with alcohol gauze dressings, over which two dry pieces of gauze are placed, the whole being kept in place by the abdominal binder. The dressings should be changed morning and evening. If no improvement occurs after two or three days and the umbilicus still continues moist, it is again tied off, and trimmed closely with the scissors or removed by the Paquelin cautery.

If the umbilical cord has fallen off at the right time, but the place of insertion does not dry up within four or five days, but instead oozes a slight secretion, blennorrhea of the umbilicus exists. On account of the constant moisture, chafing occurs in the umbilical

folds. In some infants, this may serve as the beginning of a universal eczema.

Treatment.—Thorough and even repeated cauterization of the umbilicus with silver nitrate stick, and subsequent bandaging with boric acid dry dressing. Should the blennorrhea remain untreated, a small fungoid, granulation tumor, reddish in color, with shining moist surface and varying in size from a pea to a mustard seed, may develop on the secreting surface. This so-called umbilical granuloma is always distinctly irritative, and causes restlessness of the infant, loss of desire for food, and fever. The umbilicus is puffed out, the surrounding area is intensely red and somewhat edematous. If the umbilical cord is still attached, or if the umbilical wound is covered with crusts, pus is retained. If the drainage is unobstructed, the flow of pus is generally very free. Again this results in continual moisture, and in chafing of the umbilical folds and of the skin in the immediate vicinity.

With prompt, vigorous, intelligent treatment the inflammation subsides rapidly and the edema and redness disappear. Removal of the cord or of the crusts should be had, strips of gauze should be introduced into the umbilical fold in order to afford good drainage for the pus, a moist acetate of aluminum dressing or a 3 per cent. solution of peroxide of hydrogen should be applied. The granuloma should be tied off, or, if too friable, should be touched with silver nitrate stick.

If the granuloma remains untreated, a skin will form over it after a period of weeks or months, leaving a small, pedunculated, fungoid appendage in the umbilical folds.

If the secretion from the umbilical folds becomes

more profuse, inspection of the umbilicus often reveals the presence of an umbilical ulcer—an ulcer of limited base covered with exudate and causing violent irritation of the surrounding skin. Additional neighboring ulcers frequently form in the umbilical folds, and a slight rise of temperature may accompany the condition.

Treatment.—By the introduction of gauze strips, frequently changed, free drainage is provided for the secretion. This practice is continued until the surface of the ulcer has become clean. The healing is then facilitated by the application of the silver nitrate stick or the application of a silver nitrate ointment.

A rare but much more violent affection is the inflammation of the umbilicus, termed **omphalitis**. Its appearance is, in part, dependent upon the virulence of the infecting organism, and partly upon carelessness and uncleanness in the care of the umbilical wound. It is sometimes noted in the very first few days, before the cord has come off; but also occurs later, and sometimes as late as the second or third week, post partum. In this affection the constitutional condition is always markedly involved.

The infant is restless, refuses food, and has fever. The umbilicus protrudes, the area surrounding it is intensely reddened and somewhat edematous. If the stump of the cord still is attached, or if the umbilicus is covered with crusts, the discharge of pus is hindered. If it can escape, it is found to be abundant.

Treatment.—If radical treatment is immediately carried out, such as removal of the stump or of the crusts, placing of gauze strips in the umbilical fold in order to favor free secretion, and in addition to this, moist applications of acetate of aluminum solu-

tion or peroxide of hydrogen are applied, the inflammation as well as the edema rapidly recede.

The secretion becomes less and the process limits itself to the umbilical ulcer. This appears in several forms, and is treated in the manner above described.

Gangrene of the umbilicus generally arises from an omphalitis, but it may develop also in the following manner: A bleb, filled with pus, forms at the umbilical ring; the bleb breaks and develops a progressive necrosis, by extending laterally, as well as deeply, a crater-shaped ulcer is formed which often becomes very large and continually separates shreds of necrotic tissue. The general health is markedly affected; the infant becomes pale, and cries little; the resiliency and tone of the tissues disappear; the abdominal walls are sunken; the mouth cavity is red and covered with thrush; the appetite is poor and fever is usually present. Frequently the latter disappears as the general condition grows worse.

Complications commonly occur; diarrhea develops on account of the parenteral infection; metastatic formations of pus in the articulations and in the pleura, a circumscribed peritonitis, and rupture of the abscess into the intestine may appear. Death occurs in acute collapse or by gradually increasing heart-weakness. The *prognosis* is unfavorable.

Treatment.—From the very beginning breast-milk should be given in order to prevent the danger of parenteral disturbances of nutrition; but even breast-milk often fails to do this. The local treatment is limited to a loose tampon of the ulcer and to the use of moist dressings of aluminum acetate or peroxide of hydrogen, frequently changed. This facilitates the discharge of the necrotic material and favors free drainage.

Of diseases of the umbilical vessels, arteritis is the most common; phlebitis occurs infrequently. The inflammation begins preferably in the perivascular tissues, and seldom in thrombi within the vessel lumen. This points to the fact that the infective agent does not come from without—that is, from the umbilicus—but comes from within the body. In this particular form of disease the umbilicus may be quite intact. Only a redness and a slight edema, with faint tracing of the vessels between the symphysis and the umbilicus, lead one to suspect suppuration. If the umbilical wound is patent, one can often express pus from it by massaging the vessels in a direction toward the umbilicus. If a sound is introduced, it will generally glide in the direction of the sacrum, indicating that it has entered an umbilical artery.

The *prognosis* is doubtful. Often metastatic suppuration occurs, especially if the umbilical wound is closed.

Treatment.—In this form of disease an attempt is made to limit the inflammation by means of moist dressings applied over the abdomen between the umbilicus and symphysis. If the pus flows from the umbilicus, gauze strips are introduced in order to maintain free drainage. A waiting policy is pursued in any case. In every instance, the feeding should consist only of breast-milk.

In any of these conditions, whenever healing of the wound does not take place by first intention, a disposition to the formation of umbilical hernia develops, and for this reason is a very frequent occurrence in infants. The umbilical scar is apt to give way in infants who are restless or cry a good deal: whenever there is meteorism, or in case of severe cough, and especially in pertussis. Straining, result-

ing from constipation, may cause it, but never phimosis. At the site of the umbilical fold, a protrusion occurs, which forms the umbilical hernia. Not infrequently it is combined with hernia in the linea alba, and with a diastasis of the recti muscles. None of these developments are attended with pathologic phenomena.

The *prognosis* of umbilical hernia is good. It suffices to retain the hernia by a strip of adhesive plaster about three fingers wide and about twenty centimeters long. In this way it is limited in extent. An infolding of the abdominal skin, to form a sort of pad, is superfluous, and frequently it interferes with the infant's breathing. So soon as the child learns to walk and ceases to lie chiefly in the horizontal position, the pressure of the abdominal contents is no longer directed against the abdominal walls, but rather against the floor of the pelvis. This fact and an increased fat deposit in the abdominal wall, favor the early disappearance of the hernia. Rubber bands and swaddling clothes are to be avoided. Only after the end of the second year of life should hernias be considered in the domain of surgery.

SEPTIC DISEASES OF THE NEW-BORN

Occurrence.—Sepsis presents a condition of disease more multiform than one can possibly imagine. Like local umbilical infections, under the influence of antiseptic or aseptic obstetrical methods, it is relatively a rare disease. Nevertheless, the interest manifested in this condition from the earliest times has by no means diminished.

Etiology.—Sepsis of the new-born has predominantly an enteral source. It is an intestinal infec-

tion. The gastrointestinal canal of the new-born baby, immediately after birth, is entirely sterile. After the first few hours bacteria enter the digestive tract alike from the anus and from the mouth. From that time on it is never free from them throughout the life of the individual.

The presence of bacteria is apparently indispensable to the life of the individual. Attempts to rear animals intestinally sterile usually end in failure.

The first stool flora of the new-born baby is collected arbitrarily, and presents such forms as happen to be in the infant's immediate neighborhood. Its appearance changes in a characteristic manner so soon as the infant is given food. The stool picture, which until then was without definite type, becomes uniform. Gram positive bacteria appear with breast-milk feeding, the microscopic preparation appearing colored blue throughout. Of these, the *bacillus bifidus comm.* (Tissier) is the chief representative of the physiologic stool flora of the infant, but along with it is found the *bac. lactis aerogenes*, *bac. coli comm.*, *bac. acidophilus*, *bac. putrificus*, and others; in all there are about nineteen varieties (Moro). With cow's milk feeding, on the contrary, the gram-stained preparation of the stool is predominantly red, incident to the presence of the colon bacillus.

The primary stool flora of the new-born infant is generally formed from indifferent organisms, but it may easily happen that pathogenic microorganisms enter and become conspicuous. This is especially to be feared if the infant is not cared for with scrupulous cleanliness, or if it is allowed in close contact with a mother ill of puerperal sepsis. Intestinal infection may then readily occur.

A second factor may play its part. The investi-

gations of Czerny and Moser have shown, and later clinical experiments have further proved, that the intestinal wall of the new-born infant is more permeable than that of an older child. As a result of this, an infection does not remain confined to the intestine, but rapidly passes through the barrier of the intestinal wall and causes a general constitutional sepsis.

Besides this very frequent mode of infection, septic organisms may enter the body in other ways—e.g., through injuries of the outer skin at birth, through the umbilical wound, the respiratory tract, or the urogenital mucosa, or through injury to the mucous membrane of the mouth cavity incident to rough methods of its cleansing or to the development of Bednar's aphthæ.

As causative agents, many bacteria are concerned; staphylococci, streptococci, pyocyaneus, pneumococci, proteus vulgaris, etc. It is not in any case a matter of specific infection.

The clinical picture of sepsis neonatorum is exceptionally variable. At times it is marked by a stormy beginning with the appearance of severe symptoms, chiefly pertaining to the gastrointestinal canal; again, it has an insidious beginning, with progressively increasing icterus. Occasionally, nervous phenomena predominate, and sometimes severe and uncontrollable hemorrhage. The most common manifestation of septic infection is

I. ICTERUS NEONATORUM

Occurrence.—Icterus is very frequently observed in the new-born. In the pre-antiseptic period, 90 to 100 per cent. of the new-born showed icteric discoloration. To-day, only between 20 and 30 per cent.

show it. In the majority of these the jaundice is slight; so slight, in fact, that it is frequently mistaken for a more or less physiologic condition. Treatment is often superfluous, yet, nevertheless, it is well to keep such cases under medical supervision, for jaundice is always a more or less pathologic state. The difference between mild cases and those which lead to severe septic phenomena and death is only a matter of degree. The fact that only about one-fifth of all new-born children are icteric indicates that this condition is not an entirely physiologic one.

Course.—Yellow discoloration of the skin may appear as early as the first day. In most infants it does not begin until the third, fourth or fifth day. In the milder cases only a slight icteric tinge appears upon the face, chest and back. The sclera and the mucous membranes, the soles of the feet, the palms of the hands, the urine and feces show no change. In from four to six days the skin again takes on its natural color.

In the severer cases, not alone the skin is intensely discolored, but also the nails, the sclera, the mucous membranes, the palms of the hands and the soles of the feet. Even the tears and the nasal secretion are icteric. The general constitutional condition is always profoundly affected. A persistent abnormal sopor is particularly noticeable. Nourishment is given with difficulty. The physiologic weight loss is therefore greater than normal. The meconium is quickly expelled, the milk stools which follow are often thin, frequent and of a dyspeptic character. Cylinders and fragments, colored with biliary pigment, are found in the urine. The Gmelin test is, however, generally negative.

It is only a step from these cases to the most

severe. The icterus is of a pale yellow color, often with a tinge of green. The general constitutional condition is profoundly disturbed. The infant is perpetually soporific; it lies motionless, and is emaciated by the great loss of weight. The tongue has a reddish-brown discoloration, the mouth is sticky and dry, or covered with thrush; the stools are frequent and are fluid, slimy and green; the urine is scanty. The excretion of red and white blood-cells, casts and albumin indicate the severe involvement of the kidney. The Gmelin test is frequently positive. The temperature is sometimes raised, at times normal, and often subnormal. Toward the end other septic phenomena often appear: phlegmons, intestinal hemorrhage, convulsions, and severe diarrhea.

The pathologic and anatomic findings show an intensive icterus of the tissues. This does not appear, however, in the liver, spleen, kidney, or intracranial contents. Only in very rare cases, a slight icterus of the nuclei of the cranial nerves is observed.

The *diagnosis* of icterus is obvious from inspection. Septic jaundice, nevertheless, must be differentiated: (a) From malformations of the biliary tract (aplasia, stenosis, etc.), which lead to typical alcoholic discoloration of the stool; (b) from syphilitic diseases of the liver; the differential diagnosis being cleared up by the Wassermann reaction.

The *prognosis* depends upon the intensity of the general constitutional reaction. In mild and moderately severe cases it is good; in very severe cases it is doubtful or bad. The *treatment* will be discussed later.

II. SEPTIC DIARRHEA

In this form of sepsis the phenomena relational to the gastrointestinal canal predominate.

Symptoms.—Vomiting is frequently the first pathologic symptom, but vomiting in the new-born infant must be interpreted with caution. Many an infant entirely normal in every other way, vomits during the first few hours. This vomit is black, and consists mostly of swallowed liquor amnii. It is more significant if the vomit contains mucus, or is biliary or fecal in type, and if additional symptoms on the part of the intestinal tract appear. The meconium, in these cases, is more liquid than usual. It has a putrefactive odor and is discharged rapidly. Even before the child has received nourishment, diarrhea makes its appearance. The feces consist almost wholly of intestinal secretion. If food is given, it is liable to almost immediate decomposition, the feces appearing chopped up or curded. The fecal material consists largely of particles of fatty soap, and of green, thread-like, intestinal mucus. The stools are either alkaline or acid, always foul smelling, and are much increased in number, from ten to twenty stools often passing in a day.

Very rapidly the remaining typical symptoms appear, such as fever, jaundice, loss of weight, thrush, drowsiness, intertrigo, and collapse. The kidneys are always severely involved. The urine is scanty, almost to the point of anuria. Besides uric acid crystals, casts, red and white blood corpuscles and albumin are found.

The *pathologic and anatomic examination* is very unsatisfactory, so far as the intestine is concerned,

showing only a slight swelling of the follicles of the mucous membrane.

The *diagnosis* of the septic nature of the diarrhea depends upon the jaundice, which is always present, and upon the severe lesions which the kidneys present. These conditions are not usually observed in the common disturbances of nutrition and never in such intensity.

The *prognosis* is always doubtful. It is apt to be favorable, if the diagnosis is quickly made and a rational therapy instituted early. Mother's milk must be given. If this is not available, the disease usually ends fatally.

If the infection extends to the peritoneum, there is marked distention of the abdomen. The abdominal wall is tense and shows a bluish-red discoloration. The umbilicus protrudes. The autopsy reveals the presence of a purulent peritonitis.

III. NERVOUS SYMPTOMS

That the nervous system is considerably involved, is indicated by the loss of consciousness, sopor, apathy or somnolence, and sometimes by convulsions.

Convulsions.

If convulsions occur, the infant is generally found in them quite unexpectedly. One extremity or one-half of the face, one-half of the body, or both sides twitch in slight rhythmical spasms. During these attacks the fontanelle is somewhat tense. There is loss of consciousness. After a variable period, the convulsions cease of their own accord, either definitely, or to begin anew after a time. Along with them, jaundice of varying intensity occurs, slight tempera-

ture, mild dyspeptic symptoms, drowsiness, etc. Nevertheless, the convulsions remain the most conspicuous symptom. They are repeated with varying frequency; then cease. Other symptoms will also disappear and the infant appears to have recovered.

Pathologic and anatomic conditions have not been determined, because the infants usually live. There is a well-founded suspicion, however, that these septic convulsions are an expression of anatomic lesions of the brain. A case, observed by the author, had the following outcome.

A new-born child, of three weeks, of premature but spontaneous birth. On the fourth day, icterus and diarrhea and, now and then, vomiting appeared. On the eighth day, general convulsions developed, continued on the next day, but limited to the facial distribution and to one arm. On the third day, during examination, general convulsions occurred. They then ceased and there was again apparent recovery. During the eighth week, an acute alimentary disturbance developed, ending in death. At the post mortem, the results of an earlier disease process were manifest. Extensive reddish-brown discoloration of the arachnoides at the base of the brain and of the cerebellum, with slight rose-colored spots on the dura in the right posterior cranial fossa were found.

The *differential diagnosis* may exclude tendencies to spasmophilic convulsions, which never appear in the new-born and also the terminal convulsions which occur in infants moribund as a sequence of acute alimentary disturbances. Probably, these septic convulsions are always functional, and if the child should live, are of no particular significance as regards later prognosis. They may occur even in the new-born, particularly among those who succumb to septic

diarrhea. They appear almost uniformly in infants whose general condition is good.

The *prognosis*, so far as the immediate life of the child is concerned and as to the cessation of the convulsions, is good. Next to the cases of sepsis, complicated with icterus, those showing septic convulsions give the best prognosis.

The prognosis for later life, on the contrary, must be made with great caution. It has been shown that children having convulsions in the first few days of their lives, may be afflicted later with epilepsy and other serious psychic disturbances.

Conditions of Tetany.

The conditions usually described as tetanus and trismus neonatorum have nothing to do with the specific infection of tetanus caused by the bacillus Nicolaier. Instead they are of a septic nature.

Symptoms.—The affection begins with a refusal of the infant to nurse. Preceding this by a day or two, are seen slight icteric changes in the skin. Upon close examination, the cause of the refusal to nurse is found to be a tonic contraction of the masseter muscles, or trismus. This holds the jaws so firmly closed that even passive opening is accomplished with difficulty. At the same time, reflex convulsions occur, which may be elicited by merely touching the infant or by tapping the sternum. They consist in a clonic vibration of the arms and the legs, which, after an interval, slowly die down. The convulsive closure of the jaw gives the face, which is immobile, a pinched expression. Tonic convulsions, with opisthotonus, sometimes appear. When not convulsive, the infant is quiet, does not cry and gives no expression of hunger.

The *diagnosis* has only to exclude true tetanus, which may occur in the new-born as well as in the adult. To prove the presence of tetanus bacilli Escherich advises that the suspected wound, e.g., the umbilicus, be scraped with a sharp spatula and the material obtained inoculated into mice. In the majority of cases it is impossible to prove their presence.

Prognosis.—If there are no complications, the prognosis is not unfavorable; but in these cases, also, there may be later and severe after-effects. Thus, in the case of a four month's old infant, who had seemingly recovered, we have observed an arrest of mental development and the onset of epilepsy.

IV. SEPTIC HEMORRHAGES

A striking peculiarity of sepsis neonatorum is the inclination to hemorrhages. Those coming from the gastrointestinal tract have been, from olden times, called MELENA. Hemorrhages, in the form of petechiæ, are found in almost any case of severe icterus. Other forms of hemorrhage are rare. They occur, probably, once in a thousand births.

Symptoms.—The intestinal hemorrhage begins on the second or third day and seems in particular to occur in seemingly strong, healthy infants. After the appearance of hemorrhage occurs, other symptoms develop—such as jaundice, fever, restlessness, vomiting, and a more or less severe anemia. In other cases, the general symptoms occur first and the hemorrhage appears only after eight or ten days. The blood is partly vomited, but is mostly passed by the intestines. In some infants there is only a slight admixture of blood with the stool; in others a fluid,

darkly colored stool is passed. In severe cases, a slight amount of blood flows almost continuously from the anus.

Cutaneous hemorrhages appear as petechiæ, or purple spots, or as extensive suffusions. Effusions of blood also occur in the muscles. The free bleeding of wounds is sometimes dangerous: as, for example, from small bed-sores on the heels, from rhagades of the lips, from excoriations of the anus, from the umbilical wound, arising not from the blood vessels, but rather from the granulating tissue. Hemorrhages from the macroscopically intact mucous membrane of the conjunctiva, of the nose, and of the vagina have also been observed.

The frequency with which syphilitic children have septic hemorrhages is a noteworthy fact.

Pathologic Anatomical Findings.—The causative agents of these hemorrhages are pyogenic bacteria, and perhaps also certain other microorganisms, which have been described as causative agents of hemorrhagic infections in the human organism.

In melena, erosions of the gastric mucosa and round ulcers of the stomach and of the duodenum are found. These are caused by septic infarcts. Frequently there is no lesion and one is forced to assume that capillary oozing from the mucous membrane is present.

Formerly, two other separate disease complexes were known—Buhl's disease and Winkel's disease. Both of them come under the group of septic diseases. They are now only of historical interest. Buhl's disease, or acute fatty degeneration of the new-born, shows as its leading characteristics, asphyxia, the tendency to hemorrhages, and a severe fatty parenchymatous degeneration of the internal organs.

In Winkel's disease, hemoglobinuria is the chief feature.

In the *differential diagnosis* of intestinal hemorrhage, one has to consider the so-called melena spuria (see p. 15); the umbilical hemorrhage caused by traumatic influences or by injuries from the bandage, bleeding from the vulva, or the physiological vaginal flow which occasionally occurs during the first few days and is often tinged with blood.

Hemophilia must always be thought of. This however, occurs chiefly in the male child. Its occurrence in the family history can usually be elicited by questioning the parents.

The *prognosis* is always doubtful, but in cases of true melena more than one-half of the infants affected live.

V. PYEMIC MANIFESTATIONS IN SEPSIS

The skin of the septic infant is affected in many ways. Cutaneous hemorrhages have already been mentioned, associated with which are seen rubeolar or scarlatinal erythemas often resembling a form of erysipelas with sharply defined borders but extending in different directions. On the following day the supposed erysipelatous eruption may have faded and in its place numerous furuncles appear which have their origin in septic emboli. In other cases, the temperature runs high without any definite findings until, after two or three days, an extensive phlegmon appears on the back, over the occiput or elsewhere. The most frequent and at the same time most harmless foci of purulent processes are found at the terminal phalanx of the fingers. Often each finger has a small onychia on either side of the nail.

The greatest danger of these cutaneous suppurations is their tendency to form metastases. The bones and articulations are preferably attacked; especially the ribs, the lower jaws, and the metacarpal and metatarsal bones. In the latter cases, metastases manifest themselves by sudden edema of the dorsal surface of the hands or feet, usually in both simultaneously. After one or two days, pus fluctuation, starting generally from some bone focus, is demonstrable. Of the internal organs, the pleura in the form of empyema, of the endocardium, and the kidneys, in the way of renal abscesses, are involved.

The *diagnosis* can usually be made from the outward appearance.

The *prognosis* is not altogether unfavorable. When the suppuration becomes localized, the outlook is better than in those cases in which a high fever with general septicemia is present.

The *treatment* is often very tedious and the infant emaciates a great deal. Frequently, however, a surprisingly good recovery is made. The incisions heal and the functions, even of bones and joints which have been the seat of suppuration, are again restored.

VI. PULMONARY SYMPTOMS IN SEPSIS

An intense coryza, accompanied by an abundant, thin, yellowish secretion, marks the onset of this condition. The nostrils are constantly filled with the secretion and the discharge interferes with nasal breathing. The child drinks badly and strangles easily.

A high remittent fever, with increasingly severe constitutional disturbance, indicates the involvement of the deeper air-passages. The skin shows a yel-

lowish discoloration; severe dyspnea sets in; many infants lie in opisthotonus; the nasal secretion becomes less profuse, but more purulent, and the nasal passages are excoriated and bleed easily. The thorax is held in the position of extreme inspiration. Percussion usually presents no abnormal condition, but on both sides parallel to the spinal column crepitation is heard; in the upper portions of the lung superficial or shallow breathing is found. The development of dullness generally signifies the presence of pleural complications (empyema). The general phenomena of sepsis, such as icterus, nephritis, hemorrhages, phlegmon, diarrhea, are seldom lacking.

The *prognosis* is always grave; so soon as the deeper air-passages are involved, it becomes unfavorable.

TREATMENT OF SEPSIS

In order to avoid repetition, the therapy of the various forms of sepsis is discussed collectively.

Prophylaxis.—Nothing characterizes the value of systematic prophylaxis better than the fact, already mentioned, that since the introduction of asepsis in obstetrics the number of septic infections in new-born infants has enormously decreased. For this reason it is imperative that in the care and nursing of the infant, from the moment of its birth, the greatest care and cleanliness should be exercised. The umbilical wound is to be treated according to surgical precepts. The cleansing of the mouth, and the removal of any liquor amnii it may contain, should be done as gently as possible; not, as is common, with a cloth wrapped around the finger, but instead with a small stick of wood or forceps wrapped with cotton. All further wiping out of the mouth should be strictly forbidden.

So soon as the mother shows pathologic signs, the new-born infant should be placed in another room, and only brought to her at feeding time. The nurse should always wash her hands before touching the infant. Where the environment is unfavorable, it is better for her to take care either of the mother or the infant alone. A nursing attendant suffering with suppurating wounds or infections (e.g., pharyngeal catarrh), should not handle a new-born infant.

The feeding of the infant is of great moment in the ultimate outcome of the sepsis. Usually the prognosis falls or stands upon the possibility of securing breast-milk for the infant; constituting another reason why, in every case, the infant should have maternal feeding for at least the first week of its life.

The assumption, prevalent at the present time, that most infantile septic infections originate in the intestinal canal, might lead one to assume the wisdom of giving the infant human milk as early as possible, in order that the physiologic bacterial flora may be promptly introduced and their antagonism to pathologic germs brought about speedily. This conclusion is wrong, however, for sometimes it is four or five days before the physiologic flora makes its appearance and by the introduction of food one makes it possible for pathologic organisms to grow rapidly. They develop particularly well in the intestinal secretion which is formed during the ingestion of food.

If, on the contrary, the administration of food is delayed, no intestinal secretion is formed and the existence of pathogenic bacteria is made as difficult as possible. If they remain in the intestinal canal they are either destroyed or their virulence is, at least, greatly lessened. This conception coincides with the observation that delaying the feeding gives a better

guarantee for the non-appearance of pathologic phenomena than does the early giving of food.

If the opportunity to give the infant breast-milk is lost and sepsis appears, the physician should determine the question whether he will continue to treat the infant at home or will place it in a hospital. The decision should be made early, for difficult cases do not improve even in the hospital. In the author's opinion, the artificially fed infant with sepsis should be put there, in the hope that it may receive a supply of breast-milk.

Treatment.—If a septic infection sets in, it is, from the very beginning, to be looked upon as a severe disease whose outcome is doubtful. The prognosis is particularly bad in cases in which intense jaundice, or vomiting and diarrhea set in as early as the first or second day. Only very mild cases of icterus need no treatment.

If the abnormal drowsiness of the infant interferes with its feeding, and if shaking and slapping do not suffice to awaken it so that it will drink, one should give it a short hot bath (temperature 35° C. (95° F.) to 38° C. (100° F.) continued for three minutes) with a cold sponge and vigorous rub-down following it. This can be given three times a day. Mustard packs, followed by short baths, may also be used once or twice a day. In severe cases, about one hundred grams of breast-milk should be given by stomach-tube three times a day. A considerable quantity of fluid may be further introduced by high enemata of weak tea, physiologic salt solution or mineral water. In this way the infant may be tided over a dangerous period.

If the child is restless, warm moist compresses may be used about the chest or abdomen, or both, and

changed every half hour to one hour. Frequently it will sleep for hours under this treatment. If necessary, chloral hydrate may be given every four hours, after feeding.

R Sol. chloral hydrate.....3 to 100.0
 Saccharin tab.1
 S. One-half teaspoonful every four hours.

For meteorism, an intestinal tube may be introduced and hot dry applications made to the body. Better still are high enemata of liquids (tea or mineral water) at body temperatures.

If the fever reaches a height of 39° C. (102° F.), or over, it is well to attempt its reduction by applications of cold compresses, 15° C. (59° F.), renewed three times during a half hour. If then, after two hours, the temperature again runs high, the cold compresses may be renewed.

So soon as symptoms referable to the gastrointestinal tract are manifest, one should not hesitate to take away food entirely for twenty-four hours, and give only tea or water sweetened with saccharin. The mother's breast should be emptied, of course, as thoroughly as possible, by artificial means, in order to prevent an engorgement of milk.

On the next day, one may give the infant milk again, but cautiously; 20 grams at one time, in five feedings, the second day 30 grams five times, etc., either with a spoon or from a bottle. Besides the food the infant should receive tea or water freely. Only when the amount of 100 grams, five times a day, is reached, should the infant again receive its nourishment directly from the breast. If the vomiting continues, in spite of a tea diet, the stomach should be thoroughly washed out; first with water at body

temperature and then with cold water. According to necessity the lavage may be repeated several times a day. The lavage should be used freely, especially in cases of fecal vomiting following peritonitis.

If, in spite of the tea diet, diarrhea continues, the bowels also should be washed out. If very stormy peristalsis of the intestine obtains, one should not hesitate to lengthen the tea or water diet to forty-eight hours. But in such cases, it is necessary to introduce into the organism some additional liquid. This is best done by subcutaneous infusion of from 150 to 200 cc. of physiologic salt solution. In any event, one should resume the feeding of breast milk on the third day. Small quantities only, fifty grams five times a day, are to be continued so long as recovery is progressing. Along with this, one gives an injection of salt solution every day or every other day.

In the case of an artificially fed infant, tea and saccharin are given for twenty-four hours; then for one or two days, thin oatmeal gruel with saccharin at four-hour intervals. After this, one substitutes a mixture of one-third milk, two-thirds water and saccharin. After two more days, the saccharin may be replaced by maltose. If no improvement occurs under this treatment, no time should be lost in experimenting with other foods. Instead, the infant should have breast-milk and, if necessary, be placed in a hospital to secure this.

The use of purgatives or constipative remedies is superfluous.

Where there is an inclination to low temperature, it may be necessary to apply heat by means of hot-water bottles, thermophors or hot baths. In case of threatened heart failure, restoratives should be used. In mild cases, the following may be employed:

- ℞ Liquid ammon. anisat,
 Spirit. æth.ãã. 10.0
 S. Five drops every two hours.
- ℞ Sol. caffein citrate.....0.1: 50.0
 S. One teaspoonful every two hours.

In severe cases, where quick action is desirable, one may substitute:

- Ol. camphor10.0
 By subcutaneous injection, every one to two hours.
- Caffein sod. salicylic.....1.0: 10.0
 S. Every four hours, according to age, given hypodermatically.

In cases of continuous heart weakness, digitalis is given hypodermatically. Along with these measures, mustard packs and hot bottles, with following cold douches, may be used.

In cases of convulsions and tetaniform phenomena, chloral hydrate is best given. One uses: Sol. chloral hydrate, 5.0: 100.0. Of this, two teaspoonfuls may be given, as an enema, with a hard rubber syringe. In the event of convulsions, it is well for the physician to compress the buttocks with his hands until the infant goes to sleep. So soon as it awakens, a teaspoonful of the chloral solution should be given in the tea or in its food. It is best to keep the infant under constant chloral narcosis until the convulsions have ceased for two consecutive days. The child should be handled as little as possible. It should be kept warm and fed. If it does not drink voluntarily, it must be fed by means of a nasal tube.

The serum therapy with tetanus antitoxin has been

almost **useless**, even in cases where the tetanus bacilli were **really** found. Good results have followed the use of a 25 per cent. solution of magnesium sulphate, **subcutaneously** injected in quantities of 10 c.c., twice to **four** times daily, for a number of days.

In case of gastrointestinal hemorrhages, feeding should be discontinued immediately, in order to keep the intestine empty and at rest. Then one may give intra-muscular injections of horse serum (3 to 5 cc. diphtheritic or antistreptococcic serum), after first disinfecting the skin with tincture of iodine. This, if necessary, may be repeated. The site of injection should be sealed with collodion on account of the danger of bleeding. Gelatin injections (10 to 20 cc. sterile Merck's gelatin), introduced in the subcutaneous tissues of the back may be used.*

If undefibrinated blood is used, three, five or ten cc. is taken from the vein of the father's or mother's arm by means of a Record syringe, and is immediately injected into the gluteal muscles of the infant. This may be repeated. Serum injections from human blood, as well as direct transfusion, from the radial artery of the father into the femoral artery or jugular vein of the infant, have been tried.

In case of bleeding from the umbilicus or from skin wounds, one may try the Paquelin cautery. In this event, horse-serum also is useful, it may be used both internally and locally. Adrenalin (1 tablet "hemisin," dissolved in 5 cc. water=1% adrenalin) usually fails. The same is true of calcium chloride or of styptic cotton applied locally. In hemorrhage from the vagina or the nose, strips of gauze soaked with horse-serum should be introduced as tampons.

* There is some doubt about the styptic action of sterilized gelatin.

Internal Treatment.—Teaspoonful doses of gelatin, suspensions of "bolus alba," liq. ferri sesquichloride (one drop, in gruel every hour), ext. hydrastis canad. fluid. (four drops, three times a day), may be given by mouth, but are usually without effect.

Needle punctures around bleeding points are very dangerous, for new hemorrhages may come from the puncture wounds.

If the bleeding continues in spite of treatment, one should return, after two days, to the use of cold breast-milk. The infant must always be kept warm. Liquids should be given freely by mouth and by rectum.

In the pyemic processes early incision is made as soon as pus is suspected. One should not hesitate to make manipulations, since experience has taught that permanent functional disturbance of the joints almost never results. Wide incisions are to be made and then tamponed loosely with iodoform or dermatol gauze. As a moist dressing, aluminum acetate or alcohol (90 per cent.) and glycerin in equal parts, may be used. In foul-smelling suppurations, hydrogen peroxide may be used. Such infected infants often grow thin, resembling a mere skeleton, from the effect of continued metastases. Usually, however, they recover, if they can get breast-milk.

The *treatment* of pulmonic conditions in septic new-born babies is very unsatisfactory. The aim should be to control the inflammation while it is still confined to the nose and throat by irrigations with hydrogen peroxide solution ($\frac{2}{3}$ per cent.), or with a zinc sulphate solution ($\frac{1}{2}$ per cent.), or by introducing strips of gauze moistened in a 1 per cent. silver nitrate solution. An attempt is thus made to keep the nares open and to restrict the formation

of the secretion. Congestion and swelling of the mucous membrane may be temporarily reduced by the use of adrenalin (1 "hemisin" tablet, dissolved in 5 cc. of water). Tampons of cotton soaked in this solution may be introduced into the nostrils. If the bronchi and alveoli of the lung become involved, the prognosis is very bad. The treatment is similar to that described under Influenza (p. 295).

Scleredema.

Occurrence.—In new-born, prematurely born, or weak infants, as a result of lowered temperature.

Symptoms.—Doughy, shiny swellings in the skin, which are frequently of board-like consistency. These swellings involve, also, the subcutaneous connective tissues. They generally begin in the calves of the legs and spread over the rest of the body. The joints, penis, and eyelids remain free. Subnormal temperatures are the rule.

Prognosis.—Primarily, the prognosis is good, but it depends somewhat on the general condition.

Treatment.—Keep the body warm. Local treatment is superfluous.

Sclerema.

Occurrence.—In infants with severe illness; especially in disturbances of nutrition, septic diarrhea and alimentary intoxication; or as a result of the coagulation of protein substances under the influence of high temperatures.

Symptoms.—Contrary to scleredema, the disease begins on the dorsal surfaces of the calf of the leg, the nates and the back. In other respects it resembles scleredema morphologically.

Prognosis.—Bad, since it always appears in con-

nection with some other disease and shows that the particular disease is taking an unfavorable turn.

Treatment.—That of the primary disease.

Blennorrhea of the New-born.

Occurrence.—In spite of the use of Credé's method of treating the new-born, blennorrhea is by no means rare.

Symptoms.—On the second or third day after delivery, an increasing swelling and secretion of one or both eyes appear. It becomes so marked that the palpebral fissures can no longer be opened. The secretion in a microscopical preparation with methylene blue or methyl green ("pyronin"), shows numerous pus cells, and typical intracellular gonococci. The cause of blennorrhea lies in the transfer of the gonorrheal infection of the mother to the conjunctiva of the child, through the secretion of the vagina during labor.

Diagnosis.—Traumatic influences through which an infection may be produced are to be excluded. Many new-born babies dig their finger-nails into their face or eyes. In the latter case, the eyes frequently discharge for a considerable time. Irritation from the silver nitrate solution may also lead to a chronic secretion. In every case, gonococci should be looked for.

Prophylaxis.—Sophol: 5 per cent.*

Prognosis.—With sound scientific treatment, it is good.

Treatment.—The case should be under the care of an oculist. If only one eye is affected, the other should be protected by placing over it a cotton pad and fastening it with adhesive plaster.

* Non-official remedy.

Pemphigus Neonatorum.

Occurrence.—Usually in nurslings during their first week of life; in older infants it occurs only in those who are ill.

Etiology.—Pemphigus blebs are infectious. Not infrequently the disease is carried by the midwife. In many cases the source of the infection is unknown.

Symptoms.—As the name indicates, it is a disease of blisters or blebs, which appear all over the body and even on the face and scalp. At first, they are small, but in the course of a day they grow rapidly to the size of a quarter or larger. They then resemble fluctuating water-blisters, which are covered by a thin, taut skin. The slightest pressure of the clothing will often break them and cause a discharge of clear or turbid fluid. A moist, dark red area remains. This is soon covered with a dry scab, or becomes the starting-point for an impetiginous eczema. An infant often has dozens of these blisters, and when they collapse large portions of the skin are denuded and remain as weeping surfaces. As a rule, general phenomena are lacking.

Diagnosis.—The diagnosis must exclude varicella, and above all syphilitic pemphigus (p. 253).

Prognosis.—Usually good.

Therapeutics.—Open each separate blister and cauterize the base or floor of it with a 1 per cent. silver nitrate solution, or with tincture of iodine. Powder very freely with talcum or zinc powder.

PREMATURE INFANTS

For practical purposes, these infants may be arranged in three groups:

1. Actually prematurely born infants, who are

sound and normal, but have been born too early as a result of accident or malformity, such as a contracted pelvis of the mother, traumata, etc.

2. Those born too early on account of disease in the parents, such as syphilis, tuberculosis, or alcoholism. For this reason, these infants cannot be looked upon as entirely healthy.

3. Mature but abnormally small infants; for example, twins, infants of old parents, and of mothers whose pregnancy has been unfavorably influenced by insufficient nourishment or by excessive physical exertion.

All premature infants have an abnormally low weight, usually less than 2,500 grams. The upper limit is fairly fixed, but the lowest weight at which an infant can live varies extraordinarily, and may go down to 1,000 grams; infants weighing even 700 to 800 grams have been kept alive.

Apparently, premature infants have considerable inherent vitality. For this reason the former nomenclature which designates premature infants as asthenic infants has been dropped. Czerny and Keller have proposed the term debile infants for this class of cases. If a distinction is made between the prematurely born and the mature, in regard to feeding and care, the reason for this lies in the fact that in the former there is a great disproportion between the demands which the extra-uterine life makes on the organism and the ability of the infant to meet these demands. The principal problem of the body is the maintenance of its own normal temperature. The ability to do this is wanting in the prematurely born. It possesses no constant temperature. Instead, it varies between wide extremes. There is an especial proneness to subnormal temperatures: hypothermia.

The cause of this lies partly in the inefficiency of the function of heat regulation as exercised by the thermotaxic nerve centers. It is due partly to the fact that prematurely born infants have a relatively greater skin surface than do normal infants, and therefore lose more heat than they. This fact is of great importance in relation to feeding. The greater the amount of heat lost, the greater is the energy requirement.

Because of a certain unpreparedness of the nerve centers, especially of the breathing and suckling centers, prematurely born infants are subject to attacks of asphyxia and to difficulties of nursing. They are further distinguished by a marked inability to withstand infections. These facts must be taken into consideration in the care and feeding of the premature infant.

I. THE CARE OF PREMATURE INFANTS

If the economic conditions of the family do not permit the particularly exacting care necessary in these cases, the infant should be immediately wrapped in warm clothing and woolen coverings and should be sent to a suitable hospital.

If, on the contrary, conditions permit it to remain at home, it is put into a hot bath, 38° C. (100° F.), immediately after the umbilical cord has been tied. It remains in this until the clothing and the bed can be properly warmed. In this way an initial lowering of temperature can be prevented. If a premature infant is cooled at the outset to 34° C. (93° F.) or 32° C. (89° F.), it is days before normal temperature is re-established. The infant should not be placed in a bed, but rather in a basket, which should be arranged like a nest. Hot-water bottles of earthenware, filled

with hot water or, better still, with hot sand, and covered with cloths, are placed about the baby, one at the feet and two at each side. Every hour one of these should be renewed. A thermometer should be placed beneath the infant's clothing, in order thus to control the surrounding temperature. During the first three or four weeks, it should be 30° to 35° C. (86° to 95° F.); later 26° to 30° C. (71° to 86° F.). In an atmosphere of such temperature, the infant can maintain its own temperature at about 37° C. (99° F.). Instead of hot-water bottles, thermaphores may be used. They are more comfortable, but are more likely to overheat. In general, overheating is not desirable, but it is not dangerous. Even a high rise of temperature, 41° C. (106° F.) or over, has no evil consequences.

The infant wears the usual clothing. Baths are to be omitted, unless they seem necessary for other reasons, e.g., shallow respiration, etc. Especially should all manipulations, such as changing the diapers, temperature measurements, etc., be reduced to a minimum on account of the danger of rapid cooling.

If these requirements cannot be met in the home, the infant should be taken to a hospital. Expecting the infant to die at almost any time, parents often wait days before it is sent to a hospital. The procedure should be reversed. So soon as the infant is born, it should be taken to a hospital. Most hospitals are equipped with incubators, modeled after Tarnier's *Couveuse*, or with double-walled metal tubs, in which warm water circulates; or with entire rooms properly heated. Above all, they have nurses particularly trained in the care of premature infants, and this is the most important factor. The appearance of attacks of asphyxia is indication for immediate removal of the infant to a hospital.

II. THE FEEDING OF THE PREMATURE INFANT

1. *Breast Feeding.*—In a premature infant of over 1,500 grams weight, an attempt should always be made to have it nurse at its mother's breast. Many an infant does it well, and if this is the case the feeding will give no trouble. Especial care must be taken to keep the child well tucked in during nursing, so that it will not cool easily. The mother should empty the breast after nursing as completely as possible, in order to prevent engorgement of milk. The feeding will then take exactly the same course as it does with the normal breast-fed infant.

If the infant, on the contrary, does not nurse, one may proceed in either one of two ways. A wet-nurse and her infant may be taken into the home, and the prematurely born infant should be put to the productive breast of the wet-nurse and the wet-nurse's infant to the breast of the puerperal mother; by which means lactation is established. When this has been done, and the emptying of the mammary glands is accomplished easily, one may again place the premature infant at the mother's breast for further feeding.

Otherwise, one feeds the child, until it is strong enough to nurse, with expressed mother's milk. This may be given either from a bottle or with a spoon. If one persists in expressing the milk, the lactation is thus kept up until the infant is strong enough to obtain nourishment direct from the breast. To begin feeding on the first day is not to be recommended. As with the normal child, it should be begun on the second day, and a breast feeding should be given at intervals of three or four hours. The greatest difficulties arise during the first day or a week after birth.

One must be careful, on the one hand, not to force feeding; while, on the other hand, one must not delay matters too long, in the hope of a spontaneous improvement, the infant meanwhile continually receiving insufficient nourishment. If the feeding problem should take this turn, it is best to proceed as in the case of full-term infants.

In the major number of cases, five or six feedings a day give excellent results, especially under institutional care and with trained help. The régime is changed only should difficulties arise. If the infant does not take the breast, breast-milk must be given in some other way, with spoon, pipette, or other similar contrivance. For the first few days, about five feedings a day may be given, the quantity being increased by degrees. If vomiting occurs, it is well to diminish the quantity again for a few days. Generally speaking, one may be satisfied if the quantity of food taken each day is somewhat greater than that of the preceding day. When the quantity of food given is equivalent to 100 to 110 calories of each kilogram of body-weight, or if it corresponds to about one-sixth of the body-weight, it should be sufficient to check any weight losses, and should lead to a definite increase in weight, provided the infant is kept duly warm—a detail of extreme importance.

As already stated, prematurely born infants need a larger number of calories on account of their greater heat radiation. While the postulate is theoretically correct, it does not permit the erroneous interpretation, so frequently given to it, that premature infants must, in any event, receive quantities of food equivalent to 130 to 150 calories. If, rather, they are so well supplied with energy that they spontaneously keep their own temperature at 37° C. (99° F.), sustaining

no undue loss of body-heat, one finds that they get along with the same number of calories as do full-term infants. They do this all the more readily because they consume no energy by way of muscular activity.

If the amount of food is so sufficiently large that the body-weight increases, it is well not to add to its quantity until a stationary weight indicates the need. This sort of feeding is very safe. Of course, it leads, at first, to but a moderate increase in weight, but in the end it is the best safeguard against alimentary disturbances.

2. *Artificial Feeding*.—If one is obliged to feed a premature infant artificially, the food quantities given should correspond closely with those already noted. The quality of the food must often be regulated according to the economic circumstances of the parents. In cases of poverty, it is best to use milk mixtures similar to those used with mature infants, two-thirds water, one-third milk, with sugar, given five or six times a day. The result of the feeding is not very satisfactory at first, but the infant is, at least, kept alive. In time it is able to take more food, and then begins to gain.

Better results may be obtained if buttermilk is used. It matters much, as investigations have shown, whether the prematurely born infant receives the greater part of its required calories in the form of fats or of carbohydrates. Carbohydrates are utilized better and, for that reason, only excepting breast-milk, buttermilk gives the best results.

One may use buttermilk, with 1 per cent. of flour and 4 per cent. of sugar, given in the same way and in the same quantity as recommended for breast-milk. This food may be continued until the

infant weighs from 2,500 to 3,000 grams. Then one may add the first feeding of oatmeal milk mixture (two-thirds oatmeal water, one-third milk). If this is well digested, one may gradually wean the child over to this form of food, unless one prefers to continue one or two feedings of buttermilk a day.

In any case, whether a premature infant is fed at the breast or artificially, one observes that so soon as it first begins to show good increases in weight, it demands larger quantities of food, and seems able to take care of them. It is the physician's duty to limit this desire and to avoid possible overfeeding.

3. *Difficulties in Feeding.*—Unfortunately, the feeding of the premature infant does not always proceed as smoothly as we have indicated. Often the child lies in a deathlike stupor. It makes no demand for food. It manifests no reaction whatsoever, and may lack even the strength to suck. Sometimes the suckling reflex is not adequately functional. Again, vomiting attacks may occur after each feeding. The most dangerous of conditions is in attacks of asphyxia, which are most liable to occur with or after each feeding.

Where the strength to suckle rapidly fails, one may attempt feeding every two hours, with a corresponding decrease in the quantity, or one may give enemas of breast-milk or, still better, one may introduce thirty grams of breast-milk, three times a day with a stomach tube, in addition to the regular feeding. In the event of pronounced drowsiness, one tries to keep the child awake at least during nursing by shaking and slapping it. If severe vomiting occurs, feeding by mouth may be stopped entirely for a few days and enemas of breast-milk and warm mineral water given instead.

The treatment of the tendency to asphyxia in premature infants is carried out according to the principles described on pages 50 and 51. If the infant is cyanotic, one seeks first of all to open the air-passages by making it cry vigorously. This is brought about by pinching, slapping or spanking. The asphyxia yields best if the baby is placed in a hot bath and its thorax rhythmically compressed. The oxygen tank is of the greatest service and should always be near the bed of the premature infant and ready for use.

Of the infections which threaten prematurely born infants, influenza is, with the exception of septic infections, the most dangerous. Prophylactically, on this account, all people with coryza should be barred from the vicinity of the premature infant.

Complications.—Besides the complications already mentioned, scleroderma is often found as a very frequently associated phenomenon in the premature infant. It may be avoided by keeping the baby warm. Inguinal herniæ present themselves most readily in premature children. Quite commonly they disappear spontaneously, so soon as enough fat forms in the subcutaneous connective tissues to close the orifice of the hernial sac. Until then it suffices to keep the opening closed by a woolen hernial bandage (p. 308). In the later months of infancy, prematurely born infants are more inclined to anemia and rachitis than are normal children. In both forms of disease the disturbance is evidently of embryonal origin.

In the last weeks of intrauterine life, mineral substances are freely deposited in the organism of the infant. If this procedure is interrupted by premature birth, the defect necessarily shows itself later. It is on account of these insufficient deposits of iron and calcium that anemia or rachitis manifest themselves.

Therefore, prematurely born infants should be fed vegetables, preferably in the form of vegetable powders, as early as the fifth or sixth month. These should be given once daily. In rachitis one gives gruel and vegetable foods in the sixth month at the latest. In addition, phosphorized cod-liver oil (0.01 : 100.0, half a teaspoonful twice a day) should be used.

The cranio-tabes, frequently observed during the first few weeks of life in premature infants, has nothing to do with rachitis. It disappears without treatment.

Prognosis.—The prognosis of premature birth varies according to the health condition of the parents. If the parents are well, the outlook is naturally more favorable than if the reverse is true. The weight of the child also influences the prognosis. The percentage of mortality runs about as follows: Of infants weighing 1,000 to 1,500 grams, 80 per cent.; 1,500 to 2,000 grams, 36 per cent.; 2,000 to 2,500 grams, 11 per cent.

The subjective conditions of the infant afford the best clue. Those who cry and move vigorously and suckle well are more hopeful cases than those who are drowsy, slightly cyanotic, and nurse poorly.

The *prognosis for later life* is generally good. It does happen that premature infants acquire hydrocephalus and are more inclined to suffer from psychic and nervous diseases than are normal children. They are likely to suffer with enuresis, pavor nocturnus, chorea, etc. In the matter of weight and length, they always remain a little behind mature children in their first years. At school age there are no longer any noticeable differences.

PART III

ALIMENTARY DISTURBANCES OF INFANCY

CLASSIFICATION

The old classification of the alimentary disturbances of the infant, according to the pathologic-anatomic point of view, into gastritis, enteritis, gastroenteritis, colitis, etc., is to-day entirely abandoned. In its place stands the classification of Czerny and Keller, based upon etiologic factors.

According to this classification one differentiates:

I. *Disturbances of nutrition ex alimentatione.*

By this is meant those injuries to the infant organism which are occasioned by an inadequate, or an excessive, or an irrationally combined or unbalanced food supply, though, in other respects, it may be unobjectionable and free from decomponent changes. Of the latter group we note:

(a) Disturbances due to overfeeding with cow's milk.

(b) Disturbances due to overfeeding with carbohydrates.

(c) Barlow's disease.

II. *Disturbances of nutrition ex infectione.*

By this term is meant those disorders which arise through the influence of bacteria:

(a) Acute disturbances of nutrition in the strict sense of the word: toxicoses or intoxications.

(b) Enteral infections (*sepsis neonatorum*).

(c) Para-enteral infections.

III. *Disturbances of nutrition ex constitutione.*

By this is meant those disturbances of nutrition which seem to be the result of abnormal constitutional characteristics in the infant. An inborn, abnormal chemical metabolism of certain organs or tissue-cells (Czerny).

- (a) Exudative diathesis.
- (b) Rachitis.
- (c) Anemia.
- (d) Psycho-neuropathy, neuropathy, spasmophilia, pylorospasm, and habitual vomiting.

IV. *Alimentary disturbances, due to congenital defects in the structure of the body.*

- (a) Hirschsprung's disease; (b) malformations, etc.

Another classification, proposed by Finkelstein, differentiates alimentary disturbances as follows:

I. *Alimentary disturbances due to transgression of the limits of tolerance.*

- (a) Light forms, without destructive processes.
 - 1. Disturbance of balance.
 - 2. Dyspepsia.
- (b) Severe forms with the occurrence of destructive processes.
 - 3. Decomposition.
 - 4. Intoxication.

II. *Alimentary disturbances due to deficient feeding—Inanition.*

- (a) Quantitative inanition.
- (b) Qualitative inanition (especially in the carbohydrate field).

III. *Secondary alimentary disturbances due to a primary diminution of tolerance, with infection, heat injury, etc.*

ALIMENTARY DISTURBANCES EX ALIMENTATIONE

I. OVERFEEDING WITH MILK

*An Alimentary Disturbance Due to the
Overfeeding of Breast-Milk.*

Overfeeding is the most frequent alimentary disturbance of the breast-fed baby. This class includes cases in which the breast-milk is given too frequently, or in excessive quantities.

Disturbances due to improper composition of the breast-milk, the so-called "bad" or "watery" breast-milk, play a great rôle among the laity, but in reality do not occur. All injuries ascribed to this source have other causes. Not infrequently they are due to abnormal constitutional characteristics of the infant, e.g., neuropathy, exudative diathesis, etc.

Underfeeding at the Breast.

Occurrence.—In more than two-thirds of the cases in which the physician is consulted by the mother for the purpose of finding out whether her infant is receiving enough food, the concern of the mother proves groundless. The laity quickly conclude that the infant does not get enough to eat if it is restless or sucks its fists. Neither symptom indicates underfeeding, an occurrence much more rare than is commonly supposed.

Etiology.—The etiology of underfeeding of the breast-fed infant is as follows:

1. Lack of ability of the mother to nurse. An absolute inability to nurse the infant never exists. On the contrary, however, there are many mothers who cannot give their infants a sufficient quantity of

milk. According to personal observation, about 13 per cent. of mothers nursing for the first time are unable to supply a sufficient quantity to satisfy the needs of the infant. The ability to nurse improves with later pregnancies.

In other cases the milk secretion, which has functioned normally for a time, prematurely decreases.

2. A breast which yields milk with difficulty. As previously explained, there are breasts which yield milk easily. In them the sphincters give to the slightest pressure of the infant's jaw; the milk flows forth in a stream. Again, there are those which yield milk with difficulty. In them the sphincteric contraction is abnormally firm. If one presses the sphincter at about the place in the areola mammæ where the papillæ appear, milk flows, not in streams but in drops. The strength which the infant must use to overcome such a fixed sphincter is naturally much greater than the strength needed for the excitation of an easily functioning breast. The result is that the infant quickly tires and goes to sleep. This is particularly seen in the infant who is weak and frail. The child falling asleep, one easily concludes that it is satisfied, and it is taken away from the breast. In reality it is hungry. Further developments ensue. The mother notices, after a time, that her baby is not growing well, and now attempts to nurse it more frequently; no longer every four hours, perhaps, but every two hours. This always ends in failure; for now the infant, in addition, loses its appetite and no longer nurses vigorously.

3. Late appearance of milk. This form of trouble has less significance in the matter of inanition, in that it has to deal with only a short period. It is much more important, however, in another direction, because it frequently is the cause of absolute weaning.

If, on the fourth or fifth day after delivery, the milk has not yet appeared, the mother's many counselors, and frequently also the physician, conclude that there is an absence of milk secretion (**agalactia**). As a result, they stop putting the infant to the breast and give the bottle instead. It may occur normally,



FIG. 3.
APPEARANCE OF
MILK ON
NINTH DAY.

indeed, that milk does not appear until after the eighth day. If one then attempts to return the infant to the breast, after it has had the bottle for days, it refuses absolutely, and one is forced to continue with artificial feeding.

Symptoms.—They show a breast-fed infant which is underfed and does not increase in weight, but instead remains stationary. Large losses of weight do not generally occur. Nevertheless, a certain definite emaciation begins to express itself in the infant's entire body. The abdominal walls are tense and collapsed, the so-called "starvation abdomen." Constipation is pronounced on account of the lack of adequate material to form feces, a pseudo-constipation. The stools, wanting in substance, are darkly colored. Urination is scant. Slightly subnormal temperatures are present.

With long continuance of inanition, the infant loses its agility; it is tired and drowsy; the skin becomes shriveled, easily broken, and is disposed to the formation of intertrigo and carbuncles. It is a notable fact that the infant with chronic starvation is never restless. It is always quiet and seems content. Upon questioning the mother, one learns that it usually lies at the breast a long time—from one-half to one hour.

In a few rare cases an underfed infant shows an increased number of slimy stools. Sometimes it vom-

its, in spite of the insufficient quantity of food—the so-called vomitus ex vacuo. This is probably due to the high percentage of fat which is contained in the concentrated breast-milk. It disappears with an increase in the quantity of food or upon the giving of several teaspoonfuls of mineral water before each feeding.

The *diagnosis* must determine the existing inanition. This can be done without difficulty in checking up the body-weight by the use of scales. In every case the cause of the inanition must be determined. In practice one proceeds as follows: At the hour of feeding the infant is weighed; then it is allowed to nurse freely. Afterward it is weighed again; the difference gives the amount of breast-milk taken. From this it is easy to make at least an estimate of the quantity of food taken in twenty-four hours. In these cases it usually falls considerably below Budin's figure.

A *diagnosis* of underfeeding is thus confirmed. The examination of the mother's breast may then give a further clue to the cause of underfeeding. If no milk can be expressed, or at best only one or two teaspoonfuls, then, in all probability, hypogalactia exists. If, on the other hand, the breast contains an abundant quantity of milk, it is probably a matter of difficult evacuation of the breast. One then observes the infant for about eight days more in order to avoid error. The capacity of the breast is repeatedly determined, as already indicated.

Therapy.—During this period the following therapy may be employed: The infant's stomach is washed out once or twice a day. One of the favorite, but absolutely ineffectual, galactagogues, such as "Maltz-tropon" or "Hygiama," may be prescribed for the mother. To the infant, a pepsin-hydrochloric acid

mixture (Pepsin, HCl 1.0, aq. dest. 100.0—a teaspoonful before each meal) may be given. A more convenient and a more advisable method is to give the breast at morning, noon and evening, and eventually both breasts; and in the forenoon and the afternoon, to give the bottle. In this way it is possible to use an *allaitement mixte* for months and to bring about a satisfactory development of the infant.

In the second case, where the mother has enough milk, supplemental feeding is not advisable. The infant is put to the breast every four hours, but is not allowed to nurse long—say about twenty minutes. So soon as it ceases of its own accord, it is not urged to nurse longer, but is laid down, and the mother empties the breasts further by the use of a breast-pump or by expression with the hands. The expressed milk is given to the infant with a teaspoon. In this way we see to it that the caloric supply of the infant is considerably increased, while the congestion of milk in the breast of the mother is prevented. It would be

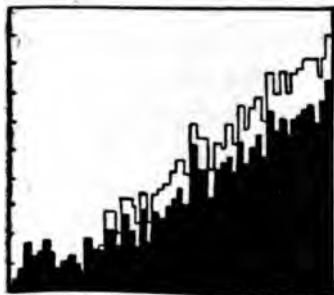


FIG. 4.—INANITION ON BREAST-FEEDING DUE TO INSUFFICIENT BREAST SECRETION.

The mother of the infant at first showed abundant milk secretion. This rapidly diminished, due to the fact that the infant, on account of weakness, was unable to empty the breast completely. After waiting for fourteen days and before the breast secretion had ceased entirely, the attempt was made to increase it by completely expressing the milk from the breast. The expressed milk was given to the infant with a spoon. By this procedure it was possible to again establish successful lactation. The dark areas show the amount of breast-milk taken spontaneously by the infant. The light areas show the amount of expressed breast-milk given.

wrong in these cases to watch and wait for spontaneous improvement; the only development one observes is a gradual cessation of the milk-output of the mother.

If one follows the stated course, just outlined for

two or three weeks, it will be seen that the infant not only gains in weight, but also that it nurses more vigorously. The difficulty is soon overcome. Whenever the appearance of the breast-milk is delayed, one should not give up hope of its appearance until after, at least, the eighth day. Even though it may become necessary to supplement the breast food with artificial feeding, it is well to allow the infant to nurse a little at each feeding time, and then to give the bottle. If the milk finally appears, the infant has at least not forgotten how to nurse.

Overfeeding at the Breast.

An event more frequent than underfeeding is overfeeding at the breast. An excessive quantity of breast-milk causes the disturbance.

Etiology.—All mothers tend more or less to interpret the cry of the infant as a sign of hunger. If they entertain this idea and, in order to quiet the infant, offer it the breast more often than is well, overfeeding results. The amount of food given in such instances often far exceeds the physiological limit. In other cases a like effect is produced unintentionally if the quantity of milk in the breast is excessive. The amount given in these cases is too large, even if the feedings are infrequent.

Symptoms.—The breast-fed infant tolerates overfeeding a long time. Little by little the alimentary disturbance it provokes becomes more and more pronounced. The infant grows more restless, frequently cries at night, vomits occasionally. There is an arrest of weight gain or even some loss. Meteorism and flatulence appear, to the accompaniment of green and frequent stools. Concern over the loose stools is generally the occasion for calling in the physician. The

feces are either passed green, or they take on this color after they have been in the napkin for some time. Rarely are they homogeneous and well-formed; much oftener they are minced, slimy, and mixed with numerous large and small white fatty-soap curds. With this abnormal discoloration of the stool there is also an increase in the number of passages. In some cases vomiting is the most prominent feature.

Before a physician is consulted the vomiting has generally assumed serious proportions. Slight vomiting, the so-called spitting, is considered, in popular opinion, as a physiological manifestation and as actually a sign of a thriving infant. It is a fact, not infrequently observed, that breast-fed infants who lose a part of the excess feeding through regurgitation thrive admirably, have good stools, and subjectively are in excellent condition. Nevertheless, all regurgitation is to be looked upon as a pathologic phenomenon. It may easily grow worse and lead up to actual vomiting, and then reach such proportions that the greater part of the feeding will be lost. This type of infant then quickly shows pronounced inanition through lack of food. The difference between simple regurgitation and habitual vomiting is only one of degree.

Pathogenesis.—Up to a certain point, diarrhea and vomiting may be looked upon as compensatory processes by which the organism rids itself of an excess of food. In the main, however, they are the expression of an abnormal course of digestion. In overfeeding, the emptying of the stomach is delayed, the hydrochloric acid secretion is diminished, the stomach contents are subject to increased bacterial decomposition, and extensive formation of fatty acids takes place. This excessive acid formation leads to an

increase of peristalsis, to the development of gas to the point of meteorism, to the stagnation of the stomach content, to the result of vomiting, etc.

The *prognosis* of a disturbance due to overfeeding with milk is good.

Diagnosis.—When vomiting occurs, the possibility of the presence of pyloric stenosis must be considered. If diarrhea exists, one must determine whether any of the other aforesaid accompanying symptoms are present. Upon the mere fact that “green” stools are present one should never pronounce a diagnosis of alimentary disturbance. (Compare with the following.) It is further necessary to determine the precise error in the feeding.

Treatment.—In breast-milk cases, the desired result is often accomplished by merely reducing the feeding periods of the infant to the normal number of five in twenty-four hours; if overproduction of milk in the breast is the cause of the alimentary disturbance, the individual periods of feeding may be decreased to twenty minutes and only one breast given at a time. Only in severe cases should more radical procedure be adopted. A laxative often has a good effect in these instances. A large dose of castor oil, two teaspoonfuls to a tablespoonful, may be given. This clears the intestine of its content. Until it is completely emptied, the breast-feeding is discontinued. Twenty-four hours later one begins again, with the regular long intervals of four-hour feedings.

The infant's natural craving for food during this fasting period must be satisfied by giving water or weak tea freely, either from a bottle or with a spoon. The tea or water is best given without sugar, but may be sweetened with saccharin. At the usual

period of feeding, the milk is expressed from the breasts of the mother. If the infant is very restless, it may be put into warm moist packs. In these, it often sleeps for hours. One may give a teaspoonful of chloral hydrate solution (3.0 chloral hydrate, to 100.0 of water sweetened with saccharin), every three to four hours. The success of this treatment is always prompt. The pathologic symptoms, restlessness, vomiting, meteorism, etc., disappear. The weight curve again takes an upward turn. The number of stools is diminished and reaches the normal habit of one or two in the day. Only the color and form of the stool, in many cases, continue to show the influence of the disturbance for a long time.

While this therapy usually relieves the vomiting, one meets with refractory cases. In these, one may be content with merely weighing the infant regularly, in order to insure the continued increase of weight despite the vomiting. This gain is commonly experienced and a waiting policy may be adopted. In the course of a few weeks, the vomiting generally ceases. If, on the other hand, the weight decreases, one may proceed as described on p. 111.

Disturbance Due to Overfeeding with Milk in Breast-fed Infants with Manifestations of Exudative Diathesis.

In all the cases hitherto mentioned, the point has been particularly emphasized that other definite symptoms of alimentary disturbance were manifest besides the diarrhea. In a large number of instances, this is not true. The infant feels subjectively well and gains in weight; oftentimes, it is not overfed. In spite of this fact, it shows green dyspeptic stools. Many breast-fed infants, in fact, constantly have bad stools; some have them only occasionally, while in

others the diarrhea alternates with constipation. These are the cases most sinned against with remedies and on this account it is necessary to point them out particularly.

In the consideration of such diarrhea one takes a standpoint to-day entirely different from that formerly taken. Then, the mother was blamed for the disturbance; to-day, the infant is held responsible. Formerly, it was supposed that errors in the diet of the mother, psychic traumata, menstruation, etc., could cause diarrhea in the infant. Definite proof of the relationship never could be brought. Impressions formed the only basis of judgment. Upon the strength of these alone, it was deemed wise to strike all kinds of food from the diet list of a nursing mother, and particularly sour foods. If a period of dyspeptic or catarrhal discharges occurred simultaneously with a menstrual period, many have even gone so far as to discontinue the breast-feeding on this account alone and to substitute cow's milk.

To-day, our conception of this matter is entirely different. In children's clinics and in other institutions where wet nurses are employed one never thinks of giving them a special diet. They receive the ordinary diet of the service staff, sometimes—horrible dictu—even herring salad and pickled cucumbers, and no one has ever observed the slightest influence upon the infant, nor, in particular, upon its stool.

Remarkable observations are sometimes made. For instance, a wet nurse nurses two infants, her own and a strange one. Both thrive normally, but while the one has infrequent, yellow, soft stools, the other has five, six and seven green, loose dyspeptic stools a day. One can only conclude that neither the mother nor the breast milk is the cause of the bad stools,

but that obviously, a deeper cause lies in the infant itself; and almost invariably the case in question is that of an infant with a special predisposition to trouble, one in fact, affected with manifestations of an exudative diathesis.

Czerny has taught us to recognize this type of infant. Observing them closely, one notes that, although breast-fed, they do not correspond fully to the normal infant. They incline toward eczema, to intertrigo of the skin folds of the genitals and the ears, to crusta lactea on the cheeks, to sebaceous deposits over the scalp—the so-called seborrhea—to scrofulous eruptions over the body and to other similar manifestations. Together with the external skin surfaces, the mucous membranes show a tendency to exudative processes, to pharyngitis, coryza, angina, secondary swelling of the cervical and sub-maxillary glands, otitis media, etc. In these cases, the tendency to frequent dyspeptic stools, in spite of exclusive breast-feeding, is very commonly observed.

The knowledge of the exudative symptom-complex is of considerable value in the diagnosis and treatment of these bowel conditions. Whoever is familiar with the picture is not taken by surprise if such infants at any time exhibit diarrhea in addition to other symptoms. If one is unfamiliar with the picture of an exudative diathesis, one may, for a moment, be in doubt whether or not an actual alimentary disturbance is present. This doubt will soon be cleared up if one stops to think that along with the diarrhea of alimentary disturbance, there are always a number of other symptoms present. These are wholly missing in such cases and this determines the course of treatment of these catarrhal stools. Their cause lies in the abnormal constitution of the

child. It is merely excreting the end-products of its digestion in an unusual manner. It is not possible to change this abnormal constitution in the course of a few days, and for this reason it is wrong to treat the diarrhea according to the principles ordinarily laid down, such as the administration of a laxative, the fasting of the infant, etc. An astringent therapy is equally useless and unnecessary.

If such an infant comes for treatment, and inspection of the stools convinces one that it is of this type, the next question is, Has the infant actually had other food than breast-milk? If this question is answered in the affirmative, one must next determine whether other manifestations of alimentary disturbance are present. If this is not the case and if, in addition, one finds other pronounced symptoms of exudative diathesis, no further active therapy is necessary. A waiting policy is to be adopted. The infant is weighed every two or three days. If it is then shown that the child, in spite of the bad stools, has gained in weight, the parents usually are also convinced that a waiting therapy is the best course and are consoled with the uninterrupted improvement and development of the infant. In yet other infants with an exudative diathesis, the disturbance due to over-feeding with milk manifests itself in the form of obstinate constipation.

Constipation in breast-fed infants is of rather frequent occurrence. In rare cases, it is caused by organic changes (congenital megacolon or Hirschsprung's disease, or pseudo-constipation due to pyloric stenosis). Generally, however, it is of a purely alimentary nature. According to Czerny, it is an expression of fat indigestion. It expresses itself in two ways: In one form, the infant has perfectly nor-

mal, yellow, soft, not over voluminous stools; the only peculiarity being that the evacuations occur abnormally seldom, once in every two or three days. These cases have always led to the opinion that their explanation lies in an exceptionally good and complete utilization of the breast-milk. A similar condition is theoretically possible in the adult. Too small a residue of food capable of forming feces remains, and on this account the stool seldom occurs. In other cases, hard, dry, compactly formed, and pale yellow scybala are voided. These often pass the sphincter and with considerable difficulty and straining on the part of the infant. In spite of the constipation, the growth and development of the infant always remain unimpaired. For this reason, medical interference is really unnecessary. Occasionally, however, one is obliged to act.

The belief that regular bowel movements are an absolute necessity is so deeply rooted in the public mind that one must now and then make concessions to the fact. One can do this all the more easily since, on the one hand, the means by which one can accomplish the result are absolutely harmless; and, since, on the other hand, one is dealing with a condition which is always temporary and disappears spontaneously, as soon as the infant receives semi-solid food with its additional feedings. So it is best to wait until the infant is six months old and until then one may occasionally use laxatives. It is, however, unnecessary to force a daily stool; one can always wait at least forty-eight hours. If no spontaneous stool occurs toward the end of the second day, a teaspoonful of fig-syrup or a like dose of castor oil and syrupus mannæ may be given. A stool will probably occur the following morning.

Abdominal massage has also been recommended to bring about regular bowel movements, but I have never seen any results from this measure. Enemata should not be used. The customary enema with chamomile tea nearly always fails. Occasionally the introduction of a syringe-nozzle, particularly if it is done awkwardly, may cause the infant to strain vigorously and in this way a stool may follow. To bring about really effectual local stimulation, it is necessary to use cold water, or water with soap-suds. Oil enemata are only slightly effectual; glycerin, on the contrary, acts with extraordinary promptitude. Objection to the use of enemata lies in the fact that they frequently give rise to anal fissures and eczema about the anus, which only adds to the difficulty by making evacuation painful. Even if these consequences are avoided, treatment by enemata offers scarcely any effectual relief from the vice of constipation. The constant manipulation of the syringe, especially if one is dealing with a vigorously resisting infant and possibly a very timid, nervous mother, causes each bowel movement to precipitate a trying family scene. A mild laxative is much more agreeably effective.

So soon as the infant is older and can take vegetables, cereals, zwieback, etc., spontaneous bowel movements occur and the use of laxatives become unnecessary. One must never lose sight of the fact that, as with the diarrheas of breast-fed infants with exudative diathesis, no unusual harm can come to an infant so long as it receives breast-milk. Therefore one should never let an existing constipation influence one to advocate weaning. Neither does it serve as an indication for a change of wet nurses.

*Disturbance Due to Overfeeding
with Milk in the Artificially-fed Infant.*

This disorder manifests itself as a chronic alimentary disturbance and occurs in infants who have been fed with the usual milk mixtures. It is assumed that these are in themselves absolutely pure and undecomposed.

Etiology.—1. It is, in part, acquired and most frequently, by overfeeding with cow's milk. It is observed when either the number or the quantity of the individual feedings is excessively increased; or when too early use of full cow's milk is permitted.

2. It may also be acquired through preceding alimentary disturbances. Intoxications, parenteral disorders, carbohydrate injuries are of this order. If one attempts, after the cessation of such a disturbance, to give the infant the same amount of milk as was given before the attack, one frequently observes that it no longer tolerates the milk, but becomes constipated and ceases to gain in weight.

3. This condition is also frequently found in infants who apparently, as a matter of idiosyncrasy, from the very beginning show a limited tolerance to cow's milk. If this line of tolerance is overstepped, disturbances at once appear.

Symptoms and Course.—The disorder manifests itself most frequently in a change of the consistency of the infant's previously normal stools. They become dry and hard, no longer adhere to the napkin, but can be shaken off easily. Their color also changes; yellow at the outset, they continually grow lighter until they finally assume a grayish white lime color. The parents are most concerned because the bowel movement occurs less and less regularly. Fi-

nally stools are passed spontaneously only every third or fourth day. This peculiar, dry, gray, alkaline, foul-smelling putrid stool, the so-called **fatty soap stool**, is the most significant symptom of disturbance due to overfeeding of milk. Its presence alone does not, however, always indicate this condition, as is too often assumed. Other symptoms must be present in connection with it. Above all, that of stationary weight. The weight curve stands still; fluctuates up and down, what was gained to-day being lost to-morrow (disturbance of balance of Finkelstein, Fig. 6). If the false assumption is made that the stationary weight is caused by insufficient food and if the supply is increased, it is not only found that no improvement occurs but that, on the contrary, a further decline ensues. Under certain conditions, and after a period of some weeks, actual atrophy may develop.

The accurate observer will not fail to recognize even earlier symptoms than these, indicative of changes in the nutrition of the infant. The sleep is lighter, the disposition becomes peevish, a slight pallor is observed, the resiliency of the skin and the muscular tone are diminished.

It may be said, however, that in cases in which overfeeding forms the chief factor in this type of alimentary disturbance, the musculature, as well as the skin tone, shows initially a strikingly good development, so that one actually notes a degree of hypertonicity.

The urine is often ammoniacal; it is passed in large quantities, not a surprising fact in view of the dryness of the stools and the large supply of fluid. Often the kidneys fail, apparently, to take care of the full quantity of water, and this leads to excessive

involved. The calcium and magnesium balance may become negative; more calcium and magnesium being excreted than are taken in with the food. Naturally, in the long run, this is not without serious consequences to the organism. For this reason it is not surprising that infants affected with this disturbance are particularly liable to rickets and spasmophilia.

Diagnosis.—If in the infant who has been fed with the usual simple cow's milk dilutions, and in whom there is no organic defect, such as pyloric stenosis or Hirschsprung's disease, constipation develops, the cause of the disturbance is almost invariably due to overfeeding with cow's milk. This diagnosis may be definitely made if soap stools are present and if, at the same time, the estimation of the amount of food taken shows that the caloric value of the food is sufficient.

The diagnosis may be difficult if conditions have been complicated by experiment with different carbohydrate mixtures or cereals. In such cases, it is well to put the infant back on one of the usual simple milk dilutions first, and then to await the characteristic disturbances of overfeeding with cow's milk.

Should this disturbance remain untreated, the *prognosis* is not good. The infant develops chronic atrophy and eventually succumbs to some intercurrent disease. If, on the other hand, the condition is treated intelligently, a good prognosis may be given.

Treatment.—Before a physician is consulted in this condition, the parents have generally attempted some form of treatment. As a rule, they draw the wrong conclusion from their observations. The existing constipation is held responsible for the restlessness of the infant. It is accordingly treated with enemata or laxatives. The lack of gain in weight,

they easily explain upon the ground of insufficient nourishment. The quantity of milk is accordingly increased. In view of all this, it should be emphasized that the use of laxatives or enemata is absolutely contraindicated in this disturbance. The symptom of constipation may be relieved by their use, but the fundamental evil still remains.

The treatment must rather aim chiefly at a reduction of the quantity of milk given and at compensation for the consequent loss of the required calories by the addition of carbohydrates to the food. The choice of a carbohydrate is often very material.

(a) In those cases in which the question is purely one of overfeeding of milk, one often accomplishes the desired result by merely reducing the quantity of food to physiological limits. This is often more easily said than done. For the infant, already very irritable, protests vigorously and with incessant crying, against any such sudden reduction of its food.

An effort should be made at first to lengthen the interval between meals, and in this way to reduce gradually the number of feedings to five in the twenty-four hours. Until the infant has become accustomed to this new method, a teaspoonful of a chloral hydrate mixture (3.0 in 100.0 of water with 1 tablet of saccharin) may be given in each feeding. In most cases a period of sleep of about three hours may be induced in this way. The improvement is usually quite prompt, so that in two or three weeks the chloral hydrate will no longer be necessary. If the infant does not sleep after the use of one teaspoonful, a second one may be given in ten minutes.

The bad habit of night-feeding may be overcome best by giving before the last late evening bottle, a prolonged warm bath. If the infant still demands

food at night it may be given fennel tea, instead of milk. If the parents object to the use of drugs, one may continue the frequent (e.g., two hour) feedings, but alternate every bottle of milk with a bottle of tea, thereby reducing the quantity of food given by one-half.

A favorable result manifests itself early and is shown by the disappearance of restlessness. The infant sleeps longer and more soundly. It does not clamor so continuously for food. The tea feeding may now be discontinued.

The procedure differs in those cases in which, with a normal quantity of food, the symptoms of disturbance due to overfeeding of milk manifest themselves. Unless one prefers to feed the infant with breast-milk, one is compelled to reduce the milk quantity, but also to supplement the feeding by the use of one or even two carbohydrates, in proportion to the degree of disturbance present.

(b) *Treatment with Breast-milk.*—This treatment is to be preferred to artificial feeding in infants during the first two months of life and in those who show extreme emaciation or suffer with such complications as spasmophilia or severe furunculosis.

This is "quoad vitam" the best therapy, but it does not always lead to prompt increase in weight. The improvement is generally ushered in by a prolonged period of stationary weight. During this time, the so-called reparatory stage, the infant repairs functionally; it becomes lively and active and learns to laugh again; the complications disappear; the furunculosis heals; but it does not gain in weight. This phenomenon must be explained to the parents beforehand.

So soon as the infant has improved sufficiently,

say in four, five or six weeks, one may try to increase the gain in weight. Frequently this can be accomplished by giving a single bottle of a carbohydrate rich milk mixture ($\frac{1}{2}$ milk, $\frac{2}{3}$ oatmeal water and sugar, or malt soup, or buttermilk). Immediately the weight curve shows a steady rise. In the course

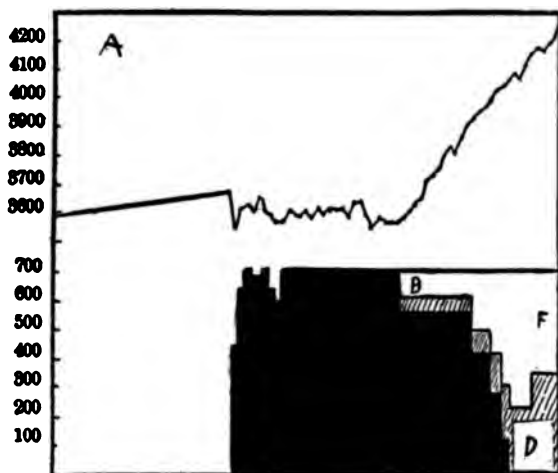


FIG. 5.—INFANT, FOUR MONTHS OLD.

Was examined and weighed at the Polyclinic when ten weeks old. He was then nursing. Six weeks later he was brought again on account of furunculosis and constipation. A few days after the first consultation the mother had weaned the baby and had fed $\frac{2}{3}$ milk and $\frac{1}{3}$ water with a teaspoonful of lactose. During the entire period the baby had only gained fifty grams. It was constantly constipated and finally developed furunculosis. On breast feeding a prolonged period of repair ensued, which was followed by good gain in weight on mixed feeding. A, disturbance due to overfeeding with cow's milk. Stage of repair on breast-milk feeding. B, $\frac{1}{2}$ milk, $\frac{2}{3}$ gruel. D, cow's milk. F, $\frac{1}{2}$ milk, $\frac{1}{2}$ gruel.

of a few weeks, the infant is weaned to the proper milk-mixture corresponding to its weight and age.

(c) *Treatment by Artificial Feeding.*—If one must depend upon the artificial feeding of the infant, it is well to correct the feeding at the beginning wherein it does not seem rational. According to the principles stated on p. 8, for instance, instead of whole milk,

a mixture of half milk and half water, with sugar, is given. If this secures no improvement, one may use, in place of water, a carbohydrate gruel (oatmeal water and, for infants older than four months, oatmeal soup).

If still there are no results, one should not hesitate still further to reduce the quantity of milk to

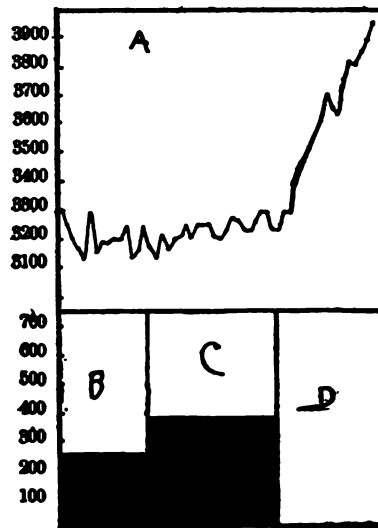


FIG. 6.—INFANT, THREE MONTHS OLD, BROUGHT FOR NYSTAGMUS FOLLOWING OTITIS MEDIA.

It was given the same food it had received at home: $\frac{1}{2}$ milk, $\frac{2}{3}$ gruel with sugar. No gain in weight following, the milk formula was increased to $\frac{1}{2}$ milk. After this increase there was still no gain, but fatty soap stools developed. Malt soup was then given, with good results. A, disturbance due to overfeeding with cow's milk. B, $\frac{1}{2}$ milk with $\frac{2}{3}$ gruel and sugar. C, $\frac{1}{2}$ milk, $\frac{1}{2}$ gruel with sugar. D, Malt soup.

one-third. The infant should then receive one-third milk, two-thirds oatmeal water, and sugar.

In many cases, even this is not sufficient. Then one may use malt sugar in the form of the malt extract instead of the ordinary sugar. In other words, one gives Keller's malt-soup, for which the disturbance

due to overfeeding of milk furnishes the most definite indication. The malt-soup is essentially a one-third milk, two-thirds wheat flour soup, and malt extract. It is prepared as follows: fifty grams, or, if high grade, thirty grams of wheat flour is beaten up in one-third liter of cold cow's milk; this mixture is passed through a sieve, to remove lumps. In another vessel, 100 grams of Löflund's malt-soup extract is dissolved in two-thirds of a liter of lukewarm water; this is combined with the first mixture. The whole is heated to boiling, being beaten constantly, and is then put into a bottle.

The effect of malt-soup is always very prompt. The increase in weight begins as early as the second day and continues constantly from that time on. The stool picture changes in a characteristic way; the movements occur spontaneously and three to four or five times a day. If this number is not exceeded no alarm need be felt. The stool is soft, of dark brown color, homogeneous and, only in a few cases, dry and compact. The malt-soup is given for five to six weeks, and then the quantity of milk is increased. The preparation of it may now be made easier; by preparing a mixture of one-half milk and one-half flour soup, adding to each flask one, two or three teaspoonfuls of malt extract. Most infants meanwhile have grown old enough to take semi-solid food.

Caution in the use of malt-soup is necessary only with very young infants. For those who are under three months, it is prepared with one-third liter of milk, two-thirds liter of water, but only thirty grams of flour and sixty grams of malt-soup extract are used to form the so-called "dilute extract malt soup."

It is very convenient to give young infants who do not gain and remain constipated on the mixture

of one-third milk and oatmeal water, one teaspoonful of malt, instead of sugar, in each bottle. If they show no improvement, one waits until they are four months old and then gives the regular malt-soup formula.

In very severe cases of disturbance due to milk overfeeding, the infant's tolerance for cow's milk fat is so reduced that it will not thrive even upon malt soup. In such cases, one must give an absolutely fat-free food, and buttermilk would be the choice.

The use of buttermilk was originated in Holland. It is made from cream which has been soured with a pure culture of lactic acid bacilli, from which the fat in the form of butter is removed by centrifuging. The preparation of this buttermilk must be carried out carefully. Bad buttermilk is a poison to infants. The buttermilk furnished by ordinary milk dealers is seldom suitable as an infant food. If one cannot get it readily from an unquestionably good dairy, where it is freshly made, it is better to use the commercial preparation ("Holländische Säuglings-nahrung," according to Kœppe-Giessen prepared by the dairy of Böhlen, in Rötha i. S. oder by Vilbel i. Holland), or to prepare it from fresh milk at home.

Buttermilk contains only .5 per cent. fat. It is therefore a food very low in caloric value. Its caloric value is increased through the addition of carbohydrates in the form of flour and sugar. It is prepared as follows:

One should use fresh buttermilk, not over twenty-four hours old. Ten grams of wheat-flour are beaten into one-fourth of a liter (or quart) of cold buttermilk; this is added to the other three-fourths liter (or quart). It is then heated for one-half hour, at

60° to 70° C. (140° to 190° F.), with constant stirring. So soon as it comes to a boil, it is drawn from the fire and is stirred vigorously; it is then brought to a boil a second and a third time. Before the last boiling, forty grams of cane sugar is added. The milk is then poured into sterile bottles.

A higher carbohydrate content, such as fifteen grams flour and sixty or seventy grams of sugar, is not advisable, as it easily leads to disagreeable, dyspeptic symptoms.

Buttermilk prepared in this way is an essentially fat-free carbohydrate-rich food. It is particularly serviceable in the feeding of the new-born, in the mixed form of feeding (*allaitement mixte*), as a supplement to breast-milk, and in the chronic form of alimentary disturbance due to overfeeding of cow's milk just described.

In this disturbance it is given for five or six weeks. The feeding is then changed to malt-soup, and after using this for another four or five weeks the infant is weaned in the manner already detailed

II. ALIMENTARY DISTURBANCES DUE TO OVERFEEDING WITH CARBOHYDRATES

The carbohydrate injury is a chronic alimentary disturbance observed in infants who have been fed for a long period exclusively or chiefly upon carbohydrate gruels.

Its *etiology* varies. Misunderstood medical instructions are not infrequently the cause of its occurrence. A mother receives a physician's advice to take milk away from her sick infant in a case of diarrhea, and to substitute for it oatmeal gruel. This is frequently interpreted to mean that the gruel must be

given continuously. Another mother, knowing that in summer milk becomes dangerous to infants, with utterly mistaken precaution gives at the onset of warm weather no milk at all, but only gruel or flour soups; with the result that the infant has no diarrhea whatever, but is all the more certain to perish at the end of the summer from carbohydrate disturbances. Rural customs also play a conspicuous rôle. In localities where the population eats much farinaceous food, the infant is fed early and often and exclusively upon bread pudding and other similar things. Serious blame and even guilt rests upon the advertising manufacturers of infant foods for the causation of carbohydrate disturbances. Their advertisements unscrupulously spread the error that milk, and even breast-milk, can be safely supplanted by these so-called infant foods.

Either the common preparation of oatmeal or oatmeal gruel is used, or soups are made of any one of the different flours (oatmeal, wheatmeal, mondamin), or from the so-called infant-foods (Nestlé's, Kufeke's, Theinhardt-meal, Mellin's, etc.). In many localities it is customary to add salt or butter or egg-yolk to these gruels; a practice which does not diminish the possibility of the development of carbohydrate disturbance. An almost identical picture is produced by the continued use, over long periods of time, of the so-called Swiss-milk, a sweetened condensed milk product.

Symptoms and Course.—Early carbohydrate disturbances are seen only accidentally by the physician. An infant may be brought to him for a hydrocele or a hernia, or any other malady, and he learns, upon questioning the mother, that the infant has had no milk for a long time, but only flour gruels. Such in-

infants often appear in no way ill; on the contrary, they are often very agile, of good muscular tone, good color and good condition of skin. On account of the rich carbohydrate diet given them they show, at first, satisfactory gain in weight. The parents are generally confirmed in the belief that they have made a correct choice of food for their infant. Soon, however, the picture changes; the child diminishes in weight, it loses appetite, and sooner or later and quite frequently too late, the parents notice that something is wrong with the infant.

If the physician is at last consulted, he finds, upon examination of the child, a picture of complete atrophy. Extreme emaciation exists; the face is pinched and bony; the eyes lie deeply in their sockets; the cheeks are sunken, only the sucking pads standing prominently out as circular elevations under the skin; the skin is white, dry and desquamating; it lies in large folds in the groins and the axilla; the entire body appears shrunken. This extreme form is observed most often in children who have been fed upon oatmeal gruel or flour soup, exclusively and without salt.

In another group of infants, a hypertonicity of the musculature is markedly noticeable. The muscles are in permanent tension, often as hard as a board, and offer a surprising resistance to passive movements. They retain their hypertonicity even in the face of the general atrophy; they stand out under the thin skin with definite contour and form (athletic musculature). This hypertonic type of carbohydrate disturbance occurs in infants who at a very early age have had much flour and, incidentally, only a small quantity of milk.

The hypertonicity, however, is not a symptom

which belongs exclusively to carbohydrate disturbances. It is found, although seldom in other disturbances of nutrition, and even in a congenital form in breast-fed infants.

More frequently seen is the so-called pasty edematous type of carbohydrate disturbance. It is induced by feeding infants upon proprietary infant foods or upon oatmeal gruel or the various flour soups, with some customary additions of salt, butter, or yolk of egg. This sort of feeding always leads, at first, to marked water retention in the tissues, and for this reason the infant appears to be doing well and seems fat and healthy. But upon closer inspection, its appearance proves suspicious; it is pale and pasty and appears bloated and swollen. Not infrequently edema is actually present. Preferably, it affects the dorsal surface of the hands and feet, or appears about the eyelids. After a while, the gain in weight ceases—the water passes off gradually and unnoticed and atrophy eventually supervenes. It is, however, not always universal. The body and the limbs may become emaciated, while the face continues, in characteristic contrast, to appear fat and pasty. Whoever sees such an infant dressed, thinks it, at first glance, a chubby-faced baby in excellent health. One is, however, dealing from the first with a very sick infant.

These infants retain their swollen, pasty appearance for a long time. Even after recovery, they still show it for weeks and months afterward. If acute complications develop, it disappears quickly and often in the course of a few days.

Physical examination of the infant frequently discloses only minor organic changes. There is no fever; rather a tendency to subnormal temperatures. Ra-

chitic symptoms are rare; the skull bones are often extraordinarily hard. The abdomen is frequently somewhat distended; the liver often palpable. The stools show few characteristics. If proprietary foods are fed they are homogeneous and brown; if oatmeal gruel is given, they are greenish, at times somewhat minced and slimy. They have, at any rate, no such characteristic appearance as the soap-stools of milk disturbances. The urine, in uncomplicated cases, is normal.

The psychic behavior reveals the severe disturbance of the nutrition in general. The infant is greatly depressed; the face always serious, the eyes large and tired, the winking of the lids infrequent; all the movements of the extremities are weak and weary.

Glandular function is, so far as can be ascertained, greatly involved. The head is never moist, but, on the contrary, unusually dry. The salivary secretion is diminished; the mouth cavity and the tongue are sticky. The mucous membrane of the larynx and esophagus also lack normal moisture. The voice is thick and aphonic. If one attempts to introduce a stomach-tube, often it will not glide in. There is always severe anorexia.

Complications.—The danger of complications is unusually great, because there is hardly any other sickness of infancy which so thoroughly destroys the immunity of the body as does carbohydrate disturbance. Even slight diseases of the respiratory tract, such as catarrh or pharyngitis, may cause a change for the worse. The dry, desquamating skin is readily vulnerable and inclines to furunculosis. The urine, in numerous cases, contains pus as an expression of pyelonephritis. Acute complications on the part of the digestive tract are observed, if an attempt is made



FIG. 7.—ATROPHIC INFANT.

Extreme atrophy such as is observed in the atrophic type of carbohydrate disturbance, grave disturbance following overfeeding with cow's milk, acute alimentary disturbance, prolonged infection, etc.

to restore milk feeding. It often leads to severe, life-threatening losses of weight.

Infants with hypertonicity are liable to show spasmophilic phenomena. A very striking compli-



FIG. 8.—PASTY EDEMATOUS TYPE OF CARBOHYDRATE DISTURBANCE.

In comparing this picture with the foregoing one may note the pronounced emaciation of the thorax, quite in contrast with the fat, round face. This infant had been fed for three months exclusively on gruels without milk. It died two days after the above photograph was taken.

cation in infants with carbohydrate disturbance is the appearance of Xerosis conjunctivæ. The appearance of this phenomenon makes the *prognosis* much more gloomy.

Pathogenesis.—Comparing the composition of milk-gruel or flour-soup with that of the normal food mixtures for infants it is obvious that although the former have a certain excess of carbohydrate, they are deficient in fat, protein and salts. Corresponding to this deficiency, a caloric underfeeding exists in infants with carbohydrate disturbances. It is not possible to satisfy the energy requirement of an infant upon a flour diet with possibly occasional additions. The increase in weight, so frequently observed at the beginning of the illness, is deceiving. It is due, not to the gain of solid substance, but to the retention of water.

The deficiency of protein and salts makes the up-building of body tissue quite impossible. The relative overfeeding with carbohydrate is a matter not indifferent to the health of the body. Its consequences have been very clearly shown. The researches of Weigert, at Czerny's clinic, have proved that carbohydrate-rich food leads to marked water retention in the tissues, and that this carries with it a reduction of the immunity of the body. This is the explanation of the fact that infants with carbohydrate disturbance are so readily subject to infection and suffer from it so severely.

The tendency to water-retention is increased if salt is added to the food. As stated already, actual edema may occur without the existence of nephritis. The water in the tissues seems to be an extraordinarily loose combination. It is lost readily upon the least disorder affecting the organism. In this way,

extreme and precipitate losses in weight occur as a result of relatively insignificant causes.

Again in cases in which no sodium chloride is given, a chloranemia develops after a time. The flour contains but a small amount of sodium chloride. In this way the glandular functions, and primarily the hydrochloric acid secretion of the stomach, are disturbed. Clinically this is expressed in an extreme loss of appetite.

The *prognosis* of carbohydrate disturbance is very grave. It is determined, however, by the age of the child, the duration of the milk-free feeding, and the presence or absence of complications. The younger the infant and the longer it has been deprived of milk, the more grave the prognosis. The advent of complications, especially those of the respiratory tract, makes the prognosis more doubtful.

Treatment.—Therapy must aim to supply, as quickly and completely as possible, the deficiency of protein, fats and salts, and to reduce the amount of carbohydrate given to a rational proportion of the other food constituents. The complete elimination of carbohydrates is unnecessary, for, if given in proper amount, they are tolerated well even by the youngest infant. Moreover, as a causative factor in the development of the carbohydrate disturbance, the use of carbohydrates is a matter of secondary importance. The chief damage is done by the absence of nitrogenous material and salts. Suddenly, or completely to omit the carbohydrates, is unsafe; so is the attempt of a day of starvation with water or tea diet. Either may lead to sudden collapse and death. The treatment must further take into consideration the fact, based upon experience, that the longer the milk-starvation period has continued the

more completely the tolerance of the infant for milk-fat has been lowered. For this reason one must begin very cautiously with the milk.

1. *Treatment with Usual Milk Mixtures.*—Favorable cases for treatment are those of older infants, particularly beyond the fourth month, who are not too emaciated, who show no edema and have suffered no other complications. In these cases, it is best not to change, in any degree, the carbohydrate feeding, but to gradually and as it were surreptitiously to introduce milk. On the first day, about twenty grams of milk may be added to the feeding, on the second day, double that quantity; on the third day, another twenty grams; and so on until a proportion of one-third milk is reached. Then it is well to pause. Some infants gain even at this period; in others the weight remains, at least, stationary. In this event, the milk is increased again in the course of eight or ten days. In a third class of cases, constipation occurs. The latter are the more favorable cases, for in them it is only necessary to exchange the sugar used for dextri-maltose or malt-soup in order to bring about good repair and recovery. In malt-soup the infant still receives, of course, a considerable amount of carbohydrate, but also a fairly definite amount of protein, fat and salts. After five or six weeks, the tolerance for milk has further improved, and one may again increase the quantity cautiously as in the treatment of disturbances due to overfeeding with cow's milk.

If in the attempt to add milk, the infant reacts with vomiting or with thin, watery stools, it is often sufficient to simply skim the milk. It will then be tolerated. To accomplish this, one allows the milk to stand one or two hours in a shallow dish; when

the upper third of the layer is skimmed off with a spoon. The remaining milk contains a comparatively low percentage of fat (1 to 1½ per cent.). Should no improvement follow this measure, it is advisable to make no further attempts with the ordinary milk mixture, but to use protein-milk.

II. TREATMENT WITH PROTEIN-MILK

In all severe cases of carbohydrate disturbance, of long duration and in young infants or in those who exhibit dyspeptic manifestations, edema and pronounced emaciation, it is best to use protein-milk. It is well to add dextri-maltose to this at once, in order to avoid unnecessary weight losses. Three per cent. of the maltose may be added at the beginning, and it may be increased to 5 and 7 per cent. If the tendency to vomiting and diarrhea persists, it is well to begin with smaller amounts for the first feeding, say fifty grams, for the second meal, increasing to sixty, seventy and eighty grams, etc. One should reach an amount proportional to the weight of the infant, not later than the third or fourth day. With protein-milk this amounts to one-fifth or one-sixth of the body weight.

If no acute symptoms arise in the stomach or the intestinal tract, the full amount of feeding may be given immediately. Interposing a hunger-day upon water or weak tea diet is unnecessary. The duration of the protein-milk period should be from five to six weeks. In every other respect, the application of the treatment is exactly that described on page 164. In many cases, a protein-milk therapy promotes excellent results; the weight very soon increasing, the edema disappearing and the infant grow-

ing brighter. If, however, these results do not appear after the expiration of the first week, it is useless to continue it further. Every delay is undesirable, for one only loses valuable time during which the infant may suffer some infection and succumb to it.

Should the infant show marked anorexia, it is again useless to continue it for any long period. The loss of appetite does not improve upon protein milk; in fact, not infrequently, one has to contend in infants having carbohydrate disturbance with a marked aversion to protein-milk, even though it be taken at first tolerably well.

3. There remains then only *breast-milk*. Invariably, it is the best therapy in carbohydrate disturbance because it re-establishes sooner than any other food the immunity of the infant and thereby diminishes the risk of secondary infection. A strict indication for breast-milk is given, if the attempt to feed with artificial food fails, or if it is a question of long duration of the carbohydrate disturbance, or if infections or spasmophilia complicate the picture. In every case breast-milk should be given in proper dosage, for in the beginning it is rather to be looked upon as a medicinal agent than a food. Should an infant with carbohydrate disturbance be placed at the breast of a wet-nurse with abundant milk secretion and be allowed to drink ad libitum, it will rapidly lose weight and perish. If a wet-nurse is to be employed, her milk should be expressed and then fed to the infant by bottle, a rather inconvenient procedure and one through which the wet-nurse will invariably lose her milk. For this reason, it is to be advised that if an infant with carbohydrate disturbance is to be fed breast-milk, it be placed in a clinic. One usually begins with the breast-milk in about half the quantity

which the infant should ordinarily receive, as determined by weight.

An infant weighing, for example, 3,600 grams, is not given 600 grams, but only 300 grams, of breast-milk, divided into five feedings a day. From week to week this quantity is increased by some 100 grams. Under this form of feeding there is at first no visible improvement. If the infant is of the atrophic type, there is apt to be a period of prolonged arrest of gains in weight. Fat, pudgy infants will even lose weight. All the retained fluid will pass out, and sometimes in a dangerous degree. Losses of 200 to 300 grams frequently occur.

After a few days, the decline in weight becomes less in such children, until finally an arrest of weight-loss is reached and the curve of weight assumes a horizontal line. In spite of this, an unmistakable improvement is noticeable in the infant. Repair is in progress, similar in many respects to that described (p. 120) under the head of Disturbances of Nutrition due to Overfeeding with Cow's Milk.

For five or six weeks breast-milk should be given exclusively. Then one bottle of a carbohydrate-rich mixture, such as buttermilk or malt-soup, may be added. A gain in weight will then begin to be apparent. After another three or four weeks, the infant may be weaned and put on a milk mixture corresponding in quality to the demands of its age and weight.

The critical period in this treatment is in the first few days following the transition from the carbohydrate-rich feeding to breast-milk alone.

The weight losses occurring during this period are at times so dangerously large that an attempt must be made to stay them, through the use of Heim-Johns

Solution (p. 173) or of some mineral water (Karlsbad-Mühlbrunn, etc.), or by the introduction of a normal saline solution subcutaneously.

In some cases, the losses continue in spite of all these measures. The general condition of the infant grows visibly worse. In such cases there is not only a loss of retained fluids, the so-called concentration losses of Tobler, but a severe damage, also, of the cellular structures, or a loss by destruction of tissue. Sometimes it is possible to stay these great weight losses, even at this stage, if small quantities of buttermilk, for one, or at the most two feedings, are given. It happens, indeed, that under this method the weight-curve will cease falling and will once more take an upward turn. Should this measure fail, the infant is hopelessly lost.

Death, in these cases of extreme weight loss, generally occurs so soon as the infant has lost one-third of the maximum weight previously attained.

In addition to this feeding therapy the general care and treatment of the infant must be carefully studied. Any affection, be it ever so inconsiderable, may lead to fatal results in an infant suffering with carbohydrate disturbance. Even a furuncle, if it develops, should be carefully opened and dressed.

To avoid dangerous complications in the respiratory tract, it is well to keep any attendant affected with catarrhal manifestations or a tendency to them, away from the neighborhood of the child.

The eyes should be cleansed daily with a boric acid solution and a mild ointment applied to the lids. If, in spite of these measures, xerosis conjunctivæ develops, no special treatment will avail. The process is so rapid and malignant that the cornea is almost always perforated and the eye lost.

Anorexia is a very unpleasant complication. To meet it medicinal treatment is useless and need not be tried. Spontaneous relief seldom occurs. If the infant steadily refuses food no other course remains but to introduce into the stomach by tube a definite quantity of food, say from 100 to 200 grams, several times a day.

III. BARLOW'S DISEASE

Barlow's disease occurs between the sixth month and the second year. Its analogue in later life is scurvy.

Etiology.—A prolonged unbalanced dietary, particularly of condensed milk, highly pasteurized, sterilized or homogenetized milk, is relational to the disease. Constitutional predisposition probably plays a part also.

Symptoms.—The symptom peculiar to Barlow's disease is hemorrhage, occurring under the periosteum of the long bones and particularly the femur. It may also occur in the maxilla, the cranial bones, especially in the orbit, and the ribs. The gums are involved if teeth are present or are approaching eruption. The mucous membrane of the nose, the conjunctiva and the intestine are frequently affected. In the external skin hemorrhage appears in the form of petechiæ or suffusions. One of the earlier symptoms is renal hemorrhage.

In addition to these extravasations of blood, irregular fever is observed. The infant presents a bad appearance. It sweats easily, is pallid, has a marked anorexia, and frequently an especial distaste for boiled milk. The affected extremities are exquisitely tender

and are held in a fixed position (pseudo-paresis). The periosteal hemorrhages appear as tumor formations.

The *pathogenesis*, at present, is far from clear. Pathologic structural changes are found in the bone marrow early in the outbreak of the disease. The lymphoid marrow atrophies and is changed to a medullary framework of structure poor in cellular and vascular elements. Simultaneously, bony growth ceases; the bones become brittle; dislocations and fractures occur. The periosteal growth is disturbed and finally hemorrhages occur under the periosteum.

Diagnosis.—The affected infant is generally brought to the physician with the statement that it has pain in the leg. Upon examination, the fact is confirmed and the presence of a tumor or swelling of the extremity in question may generally be determined. One must first of all exclude osteo-myelitis, which is always accompanied by high fever. One must rule out rachitic fractures, or infractions; remembering that in that event other and severe manifestations of rickets will be found. Finally, one must consider scurvy with this in view, and search for hemorrhage of the gums and renal hemorrhage.

The case should be submitted to careful Röntgen examination. The Röntgen picture will show a characteristic finding: a striated horizontal shadow at the epiphyseal line. It can be seen most distinctly at the lower epiphysis of the femur. Periosteal hemorrhages may frequently be discovered.

In doubtful cases, the diagnosis is often made *ex juvantibus*, that is, from the favorable effect of a suitable dietary.

In severe, unrecognized or neglected cases, with extensive hemorrhage and secondary infection, the

differential diagnosis from sepsis accompanying a hemorrhagic diathesis may be difficult.

The *prognosis* is good under proper treatment.

Treatment.—To prevent unnecessary pain the infant should be moved as little as possible. It should not be bathed. The affected joint is kept fixed and wrapped in dry cotton or in a warm compress.

Should it become necessary a small dose of chloral hydrate (one teaspoonful of a 3 per cent. solution) may be given at each feeding. In this way the infant can be kept constantly asleep. After five or six days of such treatment the tenderness subsides and the remedy may be discontinued.

Under no consideration should the hemorrhagic swellings be incised in order to relieve pressure.

The chief factor in treatment is dietary. If good cow's milk is available it is given raw, either whole or in customary dilution. If the milk is of doubtful quality it may be subjected to short, rapid sterilization. It is well to change the source of the existing milk supply. It is necessary to give fresh fruit, fruit juices and vegetables in addition to the milk. Spinach, carrots, apples, or scraped banana may be fed. In young infants, fruit juices, such as raspberry, orange, etc., or soups prepared with apples or other fruits, should be given. These things may be fed by the bottle. If anemia is marked, scraped beef, to the amount of one or two teaspoonfuls, daily, may be added to the vegetable stuffs.

This dietary must be continued for at least several weeks after apparent cure.

ALIMENTARY DISTURBANCES EX INFECTIONE

I. ACUTE ALIMENTARY DISTURBANCES (TOXICOSES)

Acute alimentary disturbances form the most important group of all diseases occurring during the first year of life because they are, most frequently, the cause of infant death. Their prevalence is greatest during the hot summer months. A rise in atmospheric temperature is invariably followed by a rise in the mortality curve of infancy. The alimentary disturbance and the mortality alike occur principally among artificially fed infants.

Etiology.—Acute alimentary disturbances are caused very commonly by food which has undergone bacterial decomposition either before its administration or after its ingestion. The material for this decomposition is furnished by the carbohydrate and the fat of the food. The products of decomposition are fermentable fatty acids which, as experimentally shown, are capable of causing diarrhea and all the accompanying symptoms of acute alimentary disturbance.

Various predisposing factors also play a part:

(1) **Summer-heat**, which favors bacterial growth and thereby increases the likelihood of milk decomposition. The influence of these bacteria is not direct. We do not have to deal with an injury of the organism through bacterial toxins or endotoxins, nor with a specific infection of the intestinal tract, as in typhus or cholera. The agents of mischief are the bacterial decomposition—products formed from the food, the fatty acids referred to above.

(2) **Preceding alimentary disturbances.** Every such attack lowers the infant's tolerance to artificial food. It may be noted, almost invariably, that infants who succumb during the hot periods of summer have been previously weakened by repeated alimentary disturbances. Their digestive functions have become exquisitely sensitive to even moderate irritation.

(3) **Premature, or very young and artificially-fed infants** exhibit much the same predisposition as those who have been the subject of repetitional disturbances.

(4) The most frequent factor of liability to alimentary disorder is a feeding method, **irrational alike in quantity and in quality of food.** In qualitative respect, food mixtures rich in carbohydrates are particularly dangerous to the infant. Undoubtedly, the more frequent of influences is overfeeding.

Recently, there has been some inclination to ascribe a further effect to summer heat than that already mentioned. These authorities imagine that the heat has a direct and immediate effect on the infant organism itself and is capable of diminishing decidedly its tolerance of food. The truth of this surmise is still a matter of conjecture.

Clinical Manifestations.

The clinical manifestations of acute alimentary disturbance vary markedly in the matter of their intensity. In mild and moderately severe cases, some degree of constitutional disturbance is seen, but their chief characteristics are their pathological manifestations in the alimentary tract. In cases running a severe course, the entire organism is profoundly affected.

General constitutional *symptoms* will even pre-

dominate and to a degree overshadow the gastro-enteric symptoms. One may picture the organism as poisoned by food. It presents an alimentary intoxication. Indeed, for this reason it is customary to place these severe cases in a special group, with a symptom-complex distinct from that of other acute alimentary disturbances. An acute alimentary dis-

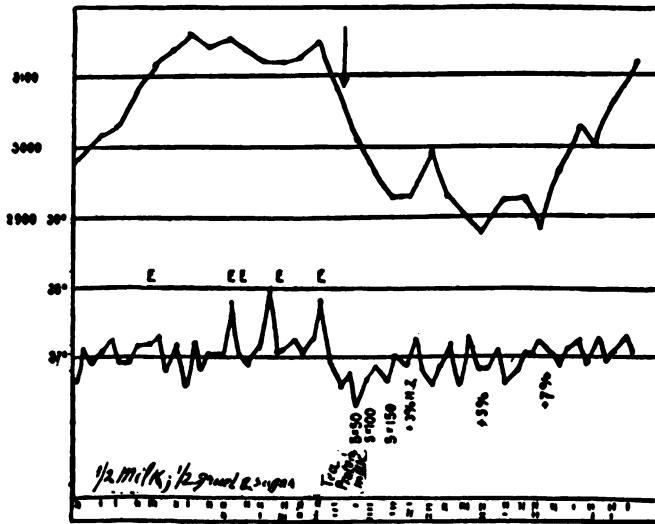


FIG. 9.—DEVELOPMENT OF AN ACUTE ALIMENTARY DISTURBANCE OF MODERATELY SEVERE DEGREE.

The notable feature is the irregular temperature curve. For the moderate rises of temperature there is little explanation. The weight curve is stationary. At times there is vomiting. With the fall in weight diarrhea develops. The temperature disappears with the discontinuance of food. Recovery on protein milk feeding. $\frac{1}{2}$ milk, $\frac{1}{2}$ gruel and sugar. Tea, protein milk, 5 x 50.

turbance may develop slowly or precipitately, in a night, as it were.

Where children are closely watched, as in pediatric clinics, it is observed that the stools become frequent and are quite liquid. The body-weight may remain stationary. The child vomits once or several

times. It does not quite empty the food-bottle. Its temperature is irregular; slight evening rises occur. After these prodromal manifestations have continued, with varying intensity, for about a week, more acute manifestations of alimentary disturbance are precipitated and frequently in a very stormy manner. The weight drops rapidly; the stool becomes distinctly diarrheal, etc.

In practice, the prodromal symptoms, if they occur at all, generally pass unnoticed. Children are brought in with the statement that the trouble began with diarrhea and vomiting. Frequently there is no vomiting and the parents mention only diarrhea. Examination shows, in most instances, a moderate degree of fever. If the baby has been weighed regularly, it will be found that it has lost decidedly in weight. These two symptoms frequently complete the picture of illness. In some cases the general condition of the child is in no respect abnormal.

When one has to deal with children who have had repeated attacks of diarrhea, or in whom, in spite of illness, the customary feeding has been continued and whose treatment has consisted in the administration of home remedies, usually astringents, one finds symptoms, referable to the alimentary tract, much more severe, and the constitutional manifestations more marked.

Primary always is the **diarrhea**. Frequent stools occur, often ten or more within twenty-four hours. They are fluid, mucous and frequently have an intensely sour or putrid odor. Their consistency and color are alike variable; now yellow and homogeneous and like pea-soup; again, of mixed color, curded and granular, consisting of green mucus and white particles of fatty soaps, occasionally mixed with blood.

Vomiting does not always occur. It is sometimes absent in severe cases. If present, it occurs generally after the administration of food, and even during the act of drinking. The body weight is always decidedly affected, even in mild cases. The weight is, at least, stationary; as a rule there is a decrease of varying degree. This may reach 300 or 400 grams, even in subacute attacks.

Anorexia is pronounced; the mucosa of the mouth is injected; the tongue red, dry and coated; the buccal cavity covered with thrush; the abdomen becomes distended; the abdominal tone diminished; the skin pale. Marked intertrigo appears about the anal region. The quantity of urine is diminished in very young infants and in severe forms lactosuria occurs. With these symptoms go many others common to a sick child: restlessness, disturbed sleep, frequent crying, etc.

Vomiting and diarrhea, according to Czerny and Keller, should be considered as **protective reactions** of the organism. In an effort, as it were, to dilute the foreign material, the intestinal capillaries pour out large quantities of fluid, which accounts for the fluidity of the discharges. Vomiting occurs in order that the stomach may be emptied of the remains of offending food. The increased peristalsis, the result of which we designate clinically as diarrhea, occurs in order that offending substances may be eliminated and removed as rapidly as possible from the intestine.

The intensity with which these reactions occur depends partly upon the toxicity of the agents introduced; since the more acute the irritation, the more profound the reaction; and partly, and in no small measure, upon the nervous system of the child itself. In severe cases, where the errors in diet have been gross and the child is of a neurotic type, one fre-

quently finds that the peristalsis does not subside with the major removal of the decomposed food from the intestinal tract. Stools are still voided, which consist largely of mucoid secretions from the intestinal glands and bacteria. The vomiting may also continue, although the stomach is empty. The hypersecretion of the intestinal wall may be long maintained and leads to the constant production of large amounts of intestinal mucus.

Course.—The outcome of an acute alimentary disturbance, if favorable, is marked by a cessation of the vomiting upon discontinuance of food. The fever present decreases. The diarrhea continues until all decomposed food has been voided. This is usually achieved within twenty-four hours. An indication of this desirable result is the so-called tea-stool. This is the name given to the discharges which follow a tea-diet. Its chief characteristic consists in absolute lack of substance, the discharge leaving only a dark green spot on the diaper.

The symptoms now subside. The giving of new and pure food is followed by the occurrence of two or three stools daily which may still show dyspeptic characteristics, but soon develop definite consistency. Not infrequently, constipation lasting several days is observed. Occasionally discontinuance of food is seemingly without influence on the persistence of diarrhea. The stools diminish in number only after considerable time. The body-weight continues to decrease, through the first three or four days of treatment, then follow a few days of stationary weight, or at least of only slight losses, until finally the curve takes an upward bend and the child begins to gain (**the stage of reparation**).

In unfavorable cases, the alimentary disturbance,

of only a few days' duration, develops additional toxic symptoms which lead to death or run into a chronic subacute course. There is some improvement at first and so long as only tea or oatmeal water is given. So soon as one attempts to return to milk with the usual precautions and to increase the quantity slowly until the food requirement of the organism is met, dyspeptic manifestations, loss of weight, etc., reappear and it becomes necessary again to decrease the food. Each succeeding attempt to nourish the child ends in a similar manner, and with these relapses the condition of the child rapidly grows worse. The body-weight continually decreases, and a decline of fifty to a hundred grams a day is not infrequent. The food consumption is usually good and adequate, but the child is incapable of utilizing it. According to Finkelstein, this stage is termed **decomposition**. In this condition, the child visibly atrophies, the pulse slows down, and subnormal temperatures occur. Toward the end, heart failure appears, one heart sound disappears entirely, and the child finally succumbs.

The Course of Alimentary Intoxication.

The severest degree of acute alimentary disturbance is known as alimentary intoxication. In this condition, the general symptoms, accompanying the diarrhea, become so pronounced that those which are referable solely to the intestinal tract are to a considerable degree overshadowed. In extreme cases, nine different symptoms are prominent. In addition to the diarrhea, a characteristic clouding of the sensorium, a change in the type of breathing, cylindruria and albuminuria, lactosuria, fever, loss in weight, collapse and leucocytosis are noted (Finkelstein). All of these symptoms are not present in every case. A

group of them suffices for a diagnosis of alimentary intoxication.

(1) *Fever*.—In order of time, the first symptom in this complex is fever. It has special significance in that it is not of infectious nature, but of so-called alimentary quality, depending for its development upon the ingestion of certain food and disappearing

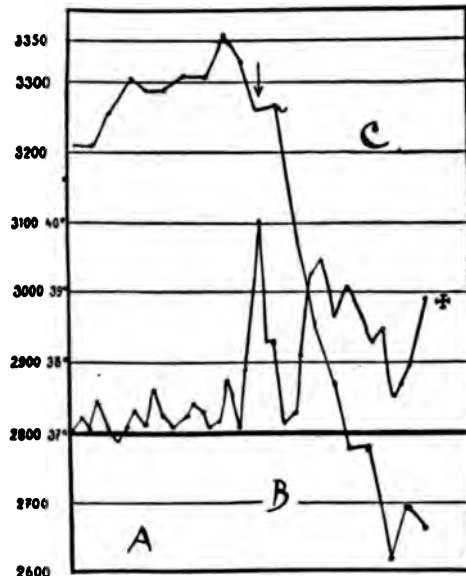


FIG. 10.—ALIMENTARY INTOXICATION.

This occurred in an infant who some time previously had suffered from a severe alimentary disturbance and had been put on breast-milk. On a mixed feeding of part bread, part buttermilk, alimentary intoxication developed. Although the buttermilk was immediately discontinued and breast-milk given alone, the case ended fatally. A, breast milk, 3 feedings; buttermilk, 2 feedings. B, tea, gruel, breast milk. C, hypodermoclysis, normal salt solution.

when this food is discontinued. It has no definite type, but shows an intermittent rise of temperature up to the highest degrees of hyperpyrexia. With discontinuance of the food, the fever falls abruptly and, in uncomplicated cases, is replaced by subnormal temperatures.

(2) *Glycosuria*.—This symptom is also of alimentary origin and occurs early. It is commonly a lactosuria, but this depends on the kind of sugar given in the food. Other forms than lactose have, at times, been found.

(3) *Albuminuria and Cylindruria*.—The urine also contains albumin and frequently casts; also leucocytes and red blood-cells. The quantity of urine is di-



FIG. 11.—STAGE OF EXCITATION.



FIG. 12.—STAGE OF DEPRESSION.

minished even to anuria. It is clouded from an abundant sediment of salts. Large amounts of uric acid crystals warrant the assumption that there are infarcts in the kidneys. The excretion of albumin and casts is not a symptom of a nephritis, but rather evidence of an extreme tissue-cell destruction as a sequence of the severe losses of fluid. This condition never, in fact, leads to nephritis, but disappears upon the cessation of the alimentary disturbance. The excretion of lactose is a result of a functional altera-

tion of the intestinal wall, in consequence of which a part of the lactose contained in the food passes the intestinal barrier unchanged and is excreted in the urine, since the organism is incapable of utilizing it as lactose.

(4) The *diarrhea* in alimentary intoxication does not differ from that already described. At first, gushing diarrheal stools are voided in large number; later, when toxic symptoms become more pronounced, atony of the bowel develops.

(5) *Weight Losses*.—The losses of weight are caused in large part through the large loss of fluid, which leaves the body through the intestinal tract, the lungs, and frequently also through vomiting.

A compensatory diminution of urine is observed, in spite of which, however, an extreme shrinkage of the body occurs. The face becomes emaciated, the fontanelle sunken, the skin leathery and harsh to the touch; if raised, the skin remains in folds; a condition especially seen in children who were in good nutrition before the illness.

(6) *Clouding of the Sensorium*.—The subjective state of health of the infant at the beginning of an attack of alimentary intoxication is similar to that of other children who are ill. It is restless, peevish, cries much and throws itself about frequently. Between times, there are states of abnormal lassitude and drowsiness often reaching a degree of coma. As the condition grows worse, the motor restlessness increases and, simultaneously, the movements of the extremities become automatic; a degree of statuesque pose and a state of catalepsy develop, the arms being held stretched out, resembling the position of a boxer, or the fingers move restlessly, picking the covers. The face has an anxious expression, and finally a distressed,

monotonous, shrill cry, lasting for hours, manifests itself,—the “crying spasm” of popular phrase. With this symptom, the stage of excitation reaches its height. Slowly it merges into the stage of depression. The crying ceases, an ominous quiet comes over the child, the face becomes rigid, mask-like. The arms with hands balled into fists, lie flexed across the thorax in spastic contracture. The eyes show strabismus; the pupils extreme myosis. The child turns up the eyes, and as the laity expresses it, lies in “still convulsions.” Not infrequently, actual convulsions manifest themselves, with a hydro-cephaloid type of breathing.

(7) *Change in the Type of Breathing.*—The thorax of the child continually surges up and down in labored respiration. These cases show acidotic breathing of the peculiar Cheyne-Stokes type; sometimes called the Kussmaul breathing (or “the great breathing”), and occurring commonly in the diabetic during the stage of coma. In both instances, it is an expression of acidosis.

The acidosis of the infant differs, however, from that of the diabetic. In the latter, there is an increased production of acid products: β -oxybutyric acid, aceto-acetic acid, acetone. Their incomplete combustion and circulation in the blood produces a genuine acidosis. In the infant with alimentary intoxication, the same effect is produced, but in a different manner. In order to neutralize the acid products arising in the intestinal tract, the organism excretes large amounts of alkali. Through this process an impoverishment of the organism in alkalies occurs (alkalipenia), and a relative acidosis is produced.

(8) *Collapse.*—Ultimately, there is a complete collapse of the infant. The extremities and the nose

are cold; the reflexes are absent or extremely sluggish. It is customary to test the corneal reflex. If the cornea is touched with the finger, the lids do not close at all, or do so very slowly. The pulse is hardly perceptible; the heart sounds are distant; finally only one or the other is still audible. The skin is discolored and assumes a brown or gray-blue appearance.

(9) *Leucocytosis*.—This condition, however, has little clinical significance.

Complications.—The most frequent complication is thrush. It is found even in the prodromal stage of the alimentary disturbance and is an early indication that the baby is not well.

In spasmophilic infants, even mild alimentary disturbances may cause convulsions. The presence of other accompanying symptoms stamps them as spasmophilic. They readily yield to treatment.

In lethal cases, another form of convulsions occurs. They are designated as **terminal convulsions** and probably depend on circulatory disturbances in the brain. They have no connection with spasmophilia and are of interest chiefly because they are always a sinister omen. A symptom of equally grave significance is the occurrence of sclerema (page 86).

The so-called paravertebral pneumonia is also the result of circulatory disturbances. The investigations of Bartenstein and Tada at Czerny's clinic have cleared up the etiology of this condition. Induced partly by the recumbent position, extravasations of blood occur in the lung tissue, especially in the dependant portions of the lung along the vertebral column. Secondarily, infection with various organisms occurs. This leads to the development of

pneumonia, frequently called streaked pneumonia (streifen pneumonia). Clinically, this form of inflammation of the lung is not recognized as readily by auscultation or percussion as it is by inspection. The infant shows a "raised thorax," that is, an abnormally high arching of the thorax in its upper half.

Diagnosis.—The diagnosis of acute alimentary disturbances in most cases is easy. Vomiting and diarrhea are fairly characteristic symptoms. Doubt whether an alimentary disturbance exists may arise when one is called in the prodromal stage of the disease and must decide whether the fears of the parents are groundless. In such cases, it is wiser to err in anticipating trouble, than to take measures when it is too late.

In the stage of alimentary intoxication the differentiation from meningitis may be difficult. The history, the condition of the fontanelle, sunken in alimentary intoxication, bulging in meningitis, and the detection of albumin and sugar in the urine, will aid in the diagnosis. In acute disturbances, one must continually think of the possibility of their parenteral origin.

The *prognosis* depends upon the condition of the infant, the nature and number of preceding attacks, and, not least, upon the kind of care and treatment the child may receive. Mild, and from the standpoint of prognosis, favorable cases are those occurring in older children, beyond the first six months, and especially when they have not been ill before and come under early treatment. These children react so readily to treatment that the physician is frequently not called in at all. The diarrhea ceases when the mother discontinues for a day the suspected milk, until she can get a better supply; in the meanwhile,

giving oatmeal gruel. This class of cases is of minor number.

More often, artificially fed infants, of but a few weeks of age, or even of premature birth, are observed. Most of them have been treated unsatisfactorily or, in spite of the existing disease, have had no treatment at all. The alimentary disturbance has already begun to assume a subacute form. The prognosis in these cases is doubtful. It is very doubtful in infants with alimentary intoxication. It need not necessarily be unfavorable in a certain percentage of infants who have been speedily "detoxicated" by means of a tea-diet for twelve to twenty-four hours. In these cases the prognosis becomes more favorable.

The issue is generally fatal in those cases in which there is no marked improvement within twenty-four hours, especially if "the great breathing" and sclerema have developed, although cases do occur in which both acidosis and sclerema disappear.

Pathogenesis.—The pathogenesis of acute alimentary disturbance is a field in pediatrics in which probably the largest amount of work has been done but in which, up to the present time, we are far from reaching any united opinion, either as to fundamental views or interpretation of individual symptoms. Czerny believes that the cause of the disturbance is to be found in the bacterial decomposition of the food, either inside or outside of the intestinal tract; and that not the bacteria themselves, but their decomposition-products are the harmful factors. The components of the food which play a part in its decomposition are the carbohydrates, not least among them the lactose, native to the milk, and the fat.

The carbohydrates are normally attacked, to a considerable degree, by bacteria in the gastro-intesti-

nal tract and are fermented to fatty acids which serve to promote normal peristalsis of the intestine. With increased carbohydrate feeding, particularly with such foods, rich in sugar, as malt soup or butter-milk, fermentation and fatty acid formation may easily reach a pathologic point.

The fat is also normally split up into fatty acids of the higher series. Under given conditions, and especially by the influence of bacteria, the higher acids may be changed to lower fatty acids. In this way the acid formation begun by carbohydrate decomposition is further increased.

In every instance then, regardless of whether the disturbance is due to overfeeding with unaltered food, or to food faulty in composition, or to food initially decomposed, we have to deal with the same result, namely, an increased formation of fatty acids (oxy-butyric acid, lactic acid, succinic acid, valerianic acid, etc.).

The actual maximum of the acid formation is not so much a determining factor as is the relation of the acidosis to the child's condition, indicative of the sensitiveness of the infant to the existing irritant. The more sensitive the infant, the lower is its resistance to the irritant and the less the degree of acidosis necessary to create disturbance. Both animal experimentation and clinical experience have taught us that the fatty acids may cause the diarrhea and all the concomitant symptoms of acute alimentary disturbance.

Finkelstein, on the contrary, lays little stress on the influence of the bacterial decomposition of milk. He believes that the causative factor is found primarily in certain harmful alimentary influences, peculiarly attaching to the nature of the whey of cow's milk. By whey is meant the fluid which separates from the

curd after treating milk with an enzyme. It contains lactose, a small proportion of lactalbumin, and most of the mineral elements of milk. It is, as it were, the medium in which the fat and protein of the milk are suspended.

The composition of whey derived from breast-milk and of whey obtained from cow's milk differ decidedly. The term whey is used here in the sense of representing the function of the salts of milk. According to Finkelstein, the foreign protein of cow's milk, contained in its own whey, causes conditions in the intestinal tract of the infant which are less favorable to the normal exercise of intestinal function than if the whey of breast-milk is present. Nevertheless, the food passage is possessed of compensatory powers which enable it to functionate normally in spite of unfavorable conditions. Should abnormal conditions arise under which these reserve functions fail, a foundation is laid, as it were, for the development of alimentary disturbance, which manifests itself particularly in the abnormal multiplication of bacteria and the consequent decomposition of food elements. This decomposition affects both carbohydrates and fats, and, again, the products of fermentation, the fatty acids, are formed. Clinical manifestations then appear both in the intestinal tract and beyond it.

The pathogenesis of individual clinical symptoms, as, for instance, the alimentary fever, is variably explained upon the basis of these conflicting views, but it is, for the present, sub judice, and may well be avoided at this time. The fundamental views in their final analysis lead, however, to a common agent in the milk, since both assume, as the initial cause of clinical symptoms, an abnormally increased acid for-

mation. This end result indicates the lines along which the treatment of acute alimentary disturbance may successfully be undertaken.

Post-mortem Findings.—The pathological findings are few in infants dying of acute alimentary disturbances. Swelling of the intestinal follicles, fatty degeneration of the liver, hypostatic congestion of the lungs are occasionally found.

PROPHYLAXIS OF ALIMENTARY DISTURBANCES

Two facts must be borne in mind if one wishes to achieve the prophylaxis of acute alimentary disturbances:

(1) That artificially fed infants are the almost exclusive victims, and that breast-feeding is apparently the best prophylactor.

(2) That among artificially fed infants, those are the most endangered who have suffered repeated attacks and relapses in midsummer.

One's object, then, should be to preserve the integrity of the infant health, as fully as possible prior to the summer season, so that, should they then become seriously ill, they may possess sufficient resistance to meet the attack.

Under existing conditions this object can be achieved only if the poorer classes of the people, among whom is the large percentage of infant mortality, can be induced to attend and to make use of pure milk depots and Infant Welfare Stations. There they may get, not only medical advice and instruction in rational infant-feeding, but also pure milk at a reasonable cost.

If milk depots or similar institutions are not avail-

able, it is important to urge mothers continually to purchase, at least for the baby's use, good cow's or goat's milk, and then to handle the milk carefully, to boil it immediately, to cool it rapidly and to keep it cold.

There is a belief prevalent among the people that deteriorated cow's milk may again be made pure by repeated boiling. Boiling it does, of course, destroy bacterial organisms, but the chemical changes which have resulted from bacterial decomposition are not done away with by this means.

To keep the milk after it has been properly cooked, is a difficult problem in the homes of the poor. Families better circumstanced make use of the refrigerator or a thermos apparatus.*

The poorer classes are obliged to use tap-water for cooling purposes. This is generally sufficient if properly used. Tap-water, in midsummer, if allowed to run fifteen minutes, will have a temperature between 12° to 16° C. (54° to 61° F.). If food is kept constantly in running water, or if it stands in water changed every hour, the temperature of the food will always be below the point at which spores, ordinarily resistant to heat, can germinate. Refrigeration is still safer in a so-called cooling chest, such, for example, as Peiser thus describes: Take a wooden box sixteen inches long, twelve inches wide and about ten inches high. Fill this with sawdust, leaving a hole in the center large enough to receive a vessel in which the milk bottle can be placed. The milk is cooled as much as possible under the tap-water and is then placed in the box, which is well closed. To make things doubly sure, the container of the milk bottles

* Demosterilizator, Bickel-Roeder.

may be filled with ice to which some salt has been added instead of water. The temperature in the chest will then always remain below 10° C. (50° F.).

It is absolutely necessary to put great stress upon the purchase of pure, raw, cow's milk, and then upon treating and keeping it carefully. All the more must this need be emphasized, since certain writers, in recent years, have tended to deny the significance of the decomposition of milk and have attempted to nullify, possibly by a few poor and inadequate experiments, the experience gathered through decades.

TREATMENT

I. Dietetic Treatment.—The food therapy follows the lines of investigation of the pathogenesis of alimentary disturbance. If the initial cause of the diarrhea and its accompanying symptoms lie in an abnormal fermentation within the gastro-intestinal tract, the aim of the therapy must be to do away with these fermentations. This may be accomplished in two ways:

(1) By excluding sugar and fat, the two ingredients of the food which principally lead to fermentation.

(2) By producing a condition in the intestinal tract unfavorable to fermentation, namely, a state of putrefaction, and preventing thus its occurrence.

In accordance with these principles acute alimentary disturbances are treated to-day. The course in practice is about as follows: Considering the age and the previous history of the infant, one attempts to form a picture of the severity of the condition.

The general practitioner should also consider

whether he will treat the case himself or will refer it to a hospital, where there is a possibility of getting breast-milk. All infants under four weeks are suitable for hospital care. All cases of acute intoxication and those in whom the attempt to feed the cow's milk has failed should be so referred.

a. In dealing with a light case, it is primarily sufficient to discontinue all food, removing the possible source of abnormal decomposition. Only weak tea sweetened with saccharin should be given. Within twenty-four hours and often earlier, the intestinal tract is empty and voids only the hunger-stool or tea-stool. The fermentation generally ceases speedily for want of fermentable material. The tea period is followed by another twenty-four hour period of thin oatmeal water. After this, milk may be slowly added to the gruel and steadily increased in quantity. An outline of this therapeutic procedure is as follows:

First day, tea with saccharin, given frequently, in small portions; second day, oatmeal gruel with saccharin, given every three hours. If the baby is very restless, tea may be given between feedings. Third and fourth days, one-third milk, two-thirds oatmeal-gruel water, sweetened with saccharin; fifth day, one-third milk, two-thirds gruel, sweetened with sugar.

After a period of eight days, the milk may be increased until the quantity given is proportional to the age and weight of the infant.

Medicinal therapy is generally unnecessary. Some physicians begin treatment with a laxative, e.g., one to two teaspoonfuls of castor oil; but there is really no actual indication for it. If the infant is very restless, it is well to place a warm compress over the abdomen and to give a tepid sponge bath toward

evening. This insures a comfortable night. Mild cases recover promptly with this form of treatment.

b. In severe cases, the result is not so certain. Among these, as aforesaid, are included young infants, in whom disturbances occur during the first four months; those also who have a history of repeated alimentary disturbances; and, finally, those in whom the disease is complicated by infection. In

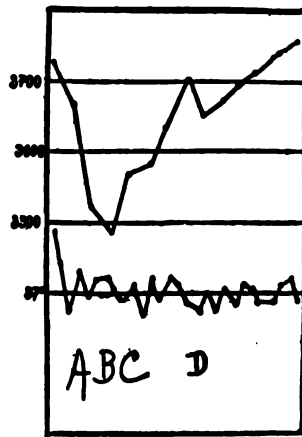


FIG. 13.—MILD ACUTE ALIMENTARY DISTURBANCE.

Treated with the usual milk mixtures. The illness had developed suddenly on the previous day, and began with vomiting and diarrhea. Tea and sugar. Gruel and sugar. $\frac{1}{8}$ milk and $\frac{3}{8}$ gruel and sugar. $\frac{1}{2}$ milk and $\frac{1}{2}$ gruel and sugar.

most of these infants, the usual milk mixtures will give good results. This is by no means invariably true and it is well to consider, at the very beginning, whether it is not safer to exclude the use of cow's milk mixtures altogether and to give breast-milk or protein-milk at once. A strict indication for this course is given if the cow's milk mixtures have already failed and have been followed by renewed dyspeptic phenomena and further weight losses.

A. Treatment with Milk Mixtures.

The treatment differs from that earlier described only in one particular: it is necessary to give milk even more warily. At first tea is again given; then oatmeal-gruel for two days; and then one begins with milk, and with only small quantities at a time. A satisfactory schedule would be as follows: First day, tea with saccharin; second and third day, gruel with saccharin every three hours; fourth day, four teaspoonfuls of milk, with gruel and saccharin; fifth day, eight teaspoonfuls of milk with saccharin; sixth day, one-third milk, two-thirds gruel, with saccharin; seventh day, one-third milk; two-thirds gruel with sugar.

In infants who give one the impression of severe illness, the milk should be skimmed or separated if it can be had pure. Whey is also very commonly used. This is prepared as in the description of protein-milk; only that in this case the casein-curd is discarded, while in the preparation of the protein-milk, the whey is not used.

If whey is used, it may be given on the fourth and fifth days, in the proportion of one-third whey to two-thirds gruel with saccharin; later, one-third milk, with gruel, may be substituted.

During the administration of whey, as of separated milk, increases of weight are not infrequently observed. These may cease when the feeding is changed to milk and the weight may even fall. Either the one or the other result is without significance, since the variation in weight is due to the rather high salt-content of both mixtures. Under careful management, the weight losses soon cease. The stools become less frequent, but generally maintain their dyspeptic

character until some sugar is added, when they usually become more consistent.

Subsequent treatment is similar to that described in cases under I. Not infrequently a disturbance due to any overfeeding of cow's milk follows, for the first few weeks, after the acute attack.

B. Treatment with Protein-Milk.

Often the discontinuance of food is not sufficient to control the intestinal symptoms. The moment milk is given, fermentation again begins and diarrhea reappears. For these cases protein-milk is the best food.

The treatment with protein milk is the most valuable practical result of Finkelstein's and Meyer's investigations of the pathogenesis of acute alimentary disturbances. It is to the credit of both authors to have shown that under certain given conditions, protein rich food mixtures may bring about favorable effects in the gastro-intestinal tract, a fact which is all the more interesting in view of the older conceptions among pediatricists. It was in the protein excess which now is shown to have a therapeutic value that the cause of the inferiority of cow's milk feeding as compared with breast-milk feeding was sought (Biedert).

The protein milk is prepared in the following manner: One liter of raw cow's milk is warmed to 40° C. (104° F.). One tablespoonful of essence of pepsin is added and the milk allowed to stand at the above-mentioned temperature for one-half hour. This period is sufficient to allow complete separation of the casein curd and the whey. The mixture is poured into a muslin bag. This is hung up and the whey allowed to drain off. After draining for one hour

the curd is passed through a fine mesh sieve along with one-half liter of water. The process is continued until the curd shows very fine division. One-half liter of buttermilk is added to the mixture, and it is then sterilized. During this process it must be stirred vigorously in order to avoid lumping of the curd. In spite of these precautions the mixture frequently shows tough curds. These can be prevented by adding about 1 per cent. flour. This milk preparation contains the protein and calcium of one and one-half liter of cow's milk, but the lactose of only one-half liter. The salt content, excepting calcium, is also reduced. The fat averages about 2.5 per cent.

This modification results in the following significant features. The reduction of lactose removes the chief substance for fermentation. It has been shown that lactose ferments more readily than other carbohydrates in the intestinal tract. Complete deprivation of sugar is, however, not feasible.

It has been shown that infants react fully as unfavorably to carbohydrate starvation as adults. Furthermore, weight increase can only be accomplished by the use of carbohydrates. For this reason, it is necessary to again add carbohydrates after a few days. The lactose should not be used, but rather maltose preparations such as dextri-maltose sugar or Soxhlet's Nähr Zucker. That these can be increased rapidly to a high percentage (5-7-10 per cent.) without onset of fermentation is due entirely to the high protein content of Protein Milk.

The protein favors putrefactive processes in the intestinal tract to such an extent that fermentations cannot occur. This explains the exceptional carbohydrate tolerance.

The decomposition products of the fat are made

harmless through the effect of the high calcium content of protein milk and their conversion into calcium soaps. This results in the formation of the fatty soap stools, such as are seen in infants with disturbance due to overfeeding on cow's milk. In the one case it represents a pathologic phenomenon, in this case it indicates a favorable result of the treatment.

The *practical application of protein milk* feeding requires a certain technique. In all other forms of treatment of alimentary disturbances caution in the dosage of the food is the first consideration. Not so with protein milk. From the very beginning the dosage is liberal.

For a period of one day, tea or water sweetened with saccharin is given. The protein milk sweetened with saccharin is then given, at first in small amounts, 10 gms. for the first feeding, 20 gms. for the second, 30 gms. for the third, and so on, constantly increasing the amount from feeding to feeding until the maximum amount which the infant can take is reached. About this time, on the third or fourth day, sugar in the form of dextri-maltose is added. The dose of the sugar is quickly increased. Beginning with 2 to 3 per cent., it is rapidly increased to 5 per cent. and even 7 per cent. (Fig. 9, p. 142).

The number and character of the stools is no criterion for the dosage of protein milk. Failure usually results from too slow an increase in the quantity or the late addition of carbohydrates. Protein milk is discontinued only if the weight drops precipitately or if diarrhea ensues. An attempt to give it again is made after twenty-four hours, and in the manner described above.

The type of infant determines the number of feedings. Generally five feedings are given, as is done in

the healthy infant. Infants with anorexia or marked tendency to vomiting may be fed more frequently, and only on one-half the amount.

The amount of protein milk required corresponds to about one-fifth of the body weight of the infant. It is higher than the usual milk mixtures, on account of the low caloric value of protein milk (450 cal.).

Protein milk feeding should be continued for about four to six weeks. If the stools become dry and infrequent, the milk may be discontinued after four weeks. If they continue frequent and soft, it is best to continue the food for six, eight or ten weeks. The change from this food to another can be immediate, or can be carried out gradually by exchanging a bottle of protein milk with one of milk mixture.

If unfavorable symptoms set in during the weaning and the stools again become thin and frequent, it is best to return to the protein milk. The attempt to change over to the milk feeding may again be made after fourteen days. It is then generally successful. During the course of the protein milk feeding the stools have the fatty soap character. The color is a light gray and the odor is very foul. They are generally dry and formed, but may be watery and frequent. From a therapeutic standpoint either condition is unimportant.

An unpleasant and not infrequent concomitant symptom is spitting after each feeding. This need give no concern. A still more unpleasant feature may obtain. After taking the food well for two or three weeks, the infant suddenly completely refuses the feeding. If a short period of starvation does not improve matters, the only recourse consists in tube feeding or complete weaning.

In the beginning of protein milk feeding, large

weight losses are not uncommon. These are met by steadily increasing the amount of food given and by the early addition of sugar. If the latter measure is delayed too long, symptoms referable to carbohydrate inanition will soon appear and express themselves, particularly in anorexia, drowsiness, and somnolence.

The preparation of protein milk in the home requires a certain amount of care, but generally is quite successful. The prepared preparations on the market are quite expensive. For this reason, attempts have been made to find substitutes. A preparation known as "larosan," and dispensed in powder form, embodies essentially the principal characteristics of protein milk and can be added to the ordinary cow's milk mixtures.

A still cheaper preparation, and one within the reach of the poorer classes, is kefir. According to Peiser, it may be prepared in the following manner: one-half liter of fresh cow's milk is put into a container holding from three-fourths to one liter. To this some form of kefir tablet is added. The container is shaken well and in this way the ferment thoroughly mixed with the milk. It is then placed in a warm place at a temperature of from 30 to 35° C. (86-95° F.). In the course of a day it is repeatedly shaken. After twenty-four hours the preparation is ready for use. The acid formed is neutralized somewhat by the addition of a teaspoonful of sodium carbonate solution (20 to 100). The mixture is then filled up to a liter by the addition of water or gruel, to which 30 gms. of dextri-maltose are added.

C. Treatment with Breast-Milk.

Breast-milk is the best therapy in every instance, but naturally it is available for only a limited number

of infants. As usual, one gives weak tea or water for twelve to twenty-four hours. If necessary, oatmeal gruel may be given for another day, and then one begins with milk. The infant is not at first put to the breast of the wet-nurse, since an excessive quantity of breast-milk may easily cause a sudden collapse; instead, the milk is given from a bottle. Five feedings of twenty grams for the first day, forty grams at five feedings for the next day, then sixty to eighty, and finally one hundred grams in each of five feedings. Along with these quantities, weak tea and water or oatmeal-gruel may be given freely. After the amount of milk given has reached one hundred grams, the infant may be put to the breast. This is not always easy, particularly in the case of an infant who has never had the breast. It refuses to take the nipple, but with sufficient patience one generally succeeds. The use of a nipple shield may sometimes be necessary. The quantity of milk the infant gets should be regularly determined by weighing before and after feeding. An attempt should be made to keep below the figures prescribed by Budin.

During the first few days of breast-feeding there is frequently no improvement; at times the infant seems even worse. At the end of the first week, however, an improvement is definite and unmistakable. The weight increases, depending largely upon the condition of the infant. Frequently one observes the successive stages of repair, described earlier under the treatment of disturbances due to overfeeding with cow's milk (p. 118).

Brief reference must be made to those infants in whom the alimentary disturbance takes on a subacute character, and eventually leads into the so-called state of decomposition. These are infants in whom the

attempt to feed the usual milk mixtures has failed, or they are such as have had no medical care, the mother having tried out the different mixtures. At any rate, they are infants who have been failing for some time. To begin the treatment in these cases with a partial starvation period is not only useless, but even dangerous. A short hunger period may lead to collapse and to death. For this reason one begins at once with breast-feeding or with protein-milk, as previously described.

With the usual milk mixtures, the results are not very gratifying. Even with them, however, one will succeed in a large number of cases. One begins with one-third whey and two-thirds oatmeal gruel, and some dextri-maltose sugar added. After several days of such feeding, one changes to milk and oatmeal-water dilutions. There will be no weight increases for a time. The tolerance of the infant increases proportionately to the care and patience one exercises in the feeding. After a time one may increase the quantity of the food, but the strength of the mixture must still remain at one-third milk. As the infant grows older, it finally arrives at a period when solid food can be given. The weight increases now become larger. Frequently, at the end of the first year, one may not tell the infant from one who has developed normally.

II. Medical and Physical Treatment.—If, in an infant with acute alimentary disturbance, the former feeding is discontinued and only tea or water given, the gastro-intestinal tract soon quiets down. Occasionally, as has been said, there are exceptions to this course. In spite of the discontinuance of food, severe vomiting continues. In such cases one attempts to

give tea in small portions—in teaspoonful doses or even in drop-doses with a medicine dropper.

Washing out the stomach generally proves to be the most effectual remedy. For this purpose much the same apparatus is used as in the adult. A glass funnel is attached to a rubber tube about three feet long. The free end of this tube is connected by a small piece of glass tubing with a No. 12 soft rubber Nélaton catheter. The catheter is oiled and is introduced with the infant in the recumbent position. While the head of the infant is fixed in mid-line by the physician's left hand, his right quickly introduces the catheter. This procedure is much more simple in the infant than in the adult. A brief noise caused by the escaping gas indicates that the opening of the catheter is in the stomach. The washing is then done with lukewarm water until the wash-water returns clear. By the introduction of copious quantities of fluid the stomach wall is also distended. If vomiting occurs, the head of the infant is turned to the side, thus allowing the vomitus to flow out of the angle of the mouth. Aspiration of fluid hardly ever occurs. Finally, the stomach is washed out a few times with cold water and is emptied thoroughly.

Accompanying the irrigation, the infant is given an enema of chloral hydrate (chloral 0.5 gram, water 20.0). This will cause the infant to sleep three or four hours, and will give the stomach a complete rest. If one now attempts to give food carefully, it is almost always retained. In like manner, if the diarrhea persists, one may try to irrigate the bowel. This is particularly indicated in cases where only small stools are passed and in which there is an apparent tenesmus. As a result of this, the infant is very restless and strains continually. This causes anal pro-

lapse and an admixture of blood with the stools. These consist entirely of intestinal mucus.

For the **bowel irrigation**, the same instrumentarium is used as for the stomach washing, excepting that the catheter should have a larger lumen of about the size of the small finger. This is introduced while the infant is lying on the side, or on the abdomen, care being taken that it is not kinked. If the abdominal walls are thin, the course of the catheter may be followed as far as the cæcum. Irrigation in this procedure is also to be carried out until the wash-water returns clear. In many cases these intestinal irrigations are very successful; in others, again, they fail absolutely.

The *restlessness* of the infant is treated by hydro-pathic methods: prolonged warm baths, 35° C. (95° F.), lukewarm packs, etc. Under these influences the infant at times sleeps for hours. Only occasionally is a narcotic necessary: veronal, 0.075 to 0.1 per dose, may be given; or, better still, chloral, 3.0 to 100.0, in teaspoonful doses, every four hours, in sweetened tea. If no sleep occurs after ten minutes, a second and a third teaspoonful may be given.

If *high fever* suggests general constitutional symptoms, the temperature may be brought down to 37° or 38° (99° to 100° F.) by cold packs, 15° C. (59° F.). If subnormal temperature is present, external heat is applied.

If symptoms of *heart-weakness* manifest themselves, a short hot bath, 38° to 40° C. (100° to 104° F.) is given three times daily, a cold douche immediately following. The hot or cold bath should be succeeded by vigorous rubbing with a bath towel, or with brandy or spirits of camphor. In private practice, the

so-called aromatic bath may also be used. It is prepared as follows:

One to two hundred grams of chamomile flowers or flowers of menth. piper. or rhizoma calami are steeped in one liter of cold water; the mixture is boiled for a quarter of an hour, allowed to infuse for a short time, and is then strained into the bath water.

Internally, the following prescriptions may be used:

℞ Caffeine citrate 0.1
 Aq. dest.ad. 50.0
 Sig. Teaspoonful every two hours.

℞ Liq. ammon.,
 Anisāā 10.00
 Sig. Sp. æther, five drops every two hours in
 sweetened water.

If collapse actually occurs, the mustard pack is used. This is prepared as follows:

Three to four handfuls of mustard flour are mixed with one liter of hot water and stirred until mustard fumes develop strongly enough to cause lacrymation. A large diaper is then dipped into the mustard water and wrung out; this is placed on a large woolen cover; the infant is entirely undressed and is fully wrapped in this blanket, leaving only the head free. The blanket is pinned with safety-pins, so that the infant cannot wriggle out of it. After twenty minutes it is taken out of the pack and is placed in a warm bath. Without drying it, the infant is then wrapped in a bath towel and placed in bed. It will generally sleep from two to three hours.

The prognosis is favorable if the skin reddens quickly after the mustard pack. If it remains pale

and cyanotic, experience shows that the condition is unfavorable. Additional remedies for acute heart failure are:

Olei camphorat., a syringeful every two hours; later alternated with caffeine citrate.

If the condition of heart weakness is prolonged, digitalin may be used intramuscularly or subcutaneously.

A very useful remedy in these cases is an infusion of normal salt solution. It guards, at the same time, against excessive loss of fluids from the tissues.

The infusion apparatus consists of a graduated glass container holding about 250 cc.; this is funnel-shaped at the lower end, to which a rubber tubing is attached, a "Y" piece of glass tubing is attached to the free end of this. To each of these tubes a rubber tubing is attached and connected with two infusion needles. The needles are inserted in the breast and pushed in as far as the axillary region. From 100 to 250 cc. of water may be given in this way.

Normal salt solution, or Ringer's solution (sodium chloride, 7.5 grams; potassium chloride, 0.1; calcium chloride, 0.2; aq. dest. 1000.0) may be used. For a long time we have added 5 per cent. of dextrose to these solutions.

Following the infusion, temperature rises sometimes occur. This is especially likely to be true if old distilled water is used in the preparation of the solution. These temperature rises were formerly looked upon as sodium chloride fevers. Numerous clinical observations have shown that they are without significance. It is well, however, to avoid them by using freshly distilled water.

The normal salt infusion may be repeated every second or third day. A very convenient preparation

to use in its place, particularly in private practice, is the Heim-Johns solution:

Sod. chloride,
 Sod. bicarb.ãã 1.0
 Sig. Dissolve tablet in 200 grams of water.

The salt content of this solution leads to water-retention, and thereby prevents the drying out of the tissues through water loss. One may give about 200 grams a day; larger doses lead to edemas. Some infants become quite thirsty after taking this dose, and on that account spontaneously drink considerable additional quantities of tea or water. Another way of giving fluid to the infant is by enema; this is given by the drop-method and is employed as follows:

A rectal tube is carried far into the intestine and is attached in the anal region in such a manner that it cannot be pressed out. Its free end is then attached to a rubber tube with a glass connection, as in the infusion apparatus used for normal salt solution. A glass device (such as is furnished by the firm of Altmann in Berlin), allowing the water to flow into the bowel at the rate of about thirty to sixty drops a minute, is inserted at some point of the rubber tube.

Finally, we would mention the use of laxatives and constipating remedies in the treatment of acute alimentary disturbances.

Formerly, this type of treatment played a foremost rôle, and even to-day the majority of older physicians practice it. Modern pediatrics scarcely ever uses them, but treats conditions purely according to cause, employing such dietetic therapy as we have described. This therapy has proved it quite possible to get along without constipative or laxative remedies.

Even though we do not recognize any indication for the use of astringent and laxative remedies, we nevertheless admit that in practice there are cases in which the physician is obliged to use such remedies. Parents often have a traditional conviction that medical treatment is insufficient if a remedy is not used. If the physician does not prescribe, they go to the druggist or apothecary, who in this matter is naturally very obliging.

In earlier times, calomel ruled. It was supposed to be, not only laxative, but also astringent and a disinfectant. At the present time only its laxative characteristic is recognized, without, however, making use of it. The effect of calomel is by no means certain, and frequently it fails. This is not the only reason, however, why pediatricists are disinclined to use it. A second reason lies in the fact that even to-day, in many families, the mother keeps her little stock of calomel powder, probably put at her disposal by an obliging physician. She uses this according to her judgment, now for the diarrhea of an infant, again for pneumonia and appendicitis in an older child. This misuse of calomel, formerly and still practiced, has caused a reaction against its use, and has led to its almost complete abandonment.

For its constipative effect, opium, in the form of Dover's powder or tinct. opii simplex, has been frequently used. The opiates have the advantage that in many cases they give to the very ill and restless infant a refreshing rest. Unfortunately, and not seldom, their sedative effect goes beyond the desired point. Regarding the benefit of a constipative effect, there is also some doubt. In reality, it only simulates an improvement where there is actually none. In this way it frequently masks the true state of affairs, and it is

better caution to leave alone than to use such a two-edged sword.

The most commonly used of remedies are the *astringents*. Of these, the proprietary medicine industry still furnishes new ones year after year. No marked difference between the various preparations really exists. For this reason the cheapest are prescribed. In some infants they cause vomiting, and for this reason they cannot be used.

If one wishes to give medicine, it is well to begin with a laxative such as castor oil, one to two teaspoonfuls, or a knife-blade full of compound liquorice powder. These will hasten the expulsion of decomposed food masses, etc., from the intestinal tract.

If this has been brought about and food is again given, astringents may be used. The following are good preparations: Tanigen, fanalbin, fannofom, fanismunt, etc. They may be given four or five times daily in knife-bladeful doses. Bismutose is also frequently used.

III. *Treatment of Alimentary Intoxication*.—Gratifying as the treatment is in the cases just mentioned, so disappointing is it in the condition of alimentary intoxication. Most favorable from the therapeutic standpoint are those cases which come freshly and immediately under treatment.

If one discontinues food for twenty-four hours in these cases and gives water or tea sweetened with saccharin, one is often agreeably surprised to find them entirely detoxicated, i.e., free from all toxic symptoms, upon the following day. For the next two days oatmeal water is given, and then breast-milk or protein-milk; or, if this is not available, whey or milk mixtures, prepared according to directions given on page 161. If the infant concerned has been ill for

days and has not improved under discontinuance of food, it is not necessary to starve it any longer. It must, by all means, be fed. The best food, of course, is breast-milk. This should, however, be given in small quantities, of ten grams, five times on the first day; twenty grams, five times, on the second day, etc. The amount should be increased daily by about ten grams per feeding.

Even should improvement occur, it is not wise to depart from this cautious practice. The appetite, however, is generally so diminished that it is difficult to give even these small quantities. So long as toxic symptoms are present, it is not safe to exceed 250 to 300 grams of breast-milk a day.

In severe alimentary intoxication, skimmed (centrifuged) breast-milk has been recommended. If infants are so ill, however, that they cannot survive on breast-milk, given in careful dosage, they will generally die when skimmed breast-milk is given.

If artificial feeding is employed, it is well to begin with one-third whey and two-thirds oatmeal gruel and saccharin. If improvement occurs within a few days, one may change to one-third skimmed milk and two-thirds oatmeal gruel and saccharin. Again, after a few days, the saccharin may be replaced by maltose, and finally, after a considerable period, the skimmed milk may be replaced by full cow's milk. The more cautious the progress, the more certain one is to avoid relapses. In every case, whether upon breast-milk or artificially fed, it is absolutely necessary to give additional fluids freely in order to anticipate and prevent the excessive loss of fluid from the tissues.

The remedies and methods of medicinal and physical therapy mentioned previously must be used according to indication.

If an infant becomes ill with vomiting and diarrhea while on *l'allaitement mixte*, it is well to discontinue both the breast-milk and the artificial food, to give a laxative, and for twenty-four hours to allow only weak tea or water. The breasts of the mother, in the meanwhile, must be emptied by expression.

The following day the baby is put to the breast, three times—at morning, noon and evening, and at other feeding times still receives tea. On the following day oatmeal gruel may be substituted for tea. After a few days, more milk is added to the oatmeal gruel. Not infrequently, the stools of the breast-fed infant will retain a dyspeptic appearance for some time after convalescence. They resume normal appearance only after the infant has been weaned entirely from the breast and put on cow's milk.

If, in the act of weaning, alimentary disturbances occur, the dyspepsia ablactantium of earlier times, all food should be discontinued for twenty-four hours. Weak tea or water may be given freely. An attempt is then made to put the infant back to the breast. If the milk secretion during this time has decreased, it is to be considered rather an advantage than a disadvantage. For if only small quantities of breast-milk are given, the convalescence is much more rapid than when a large supply is available. It is, of course, always necessary to give water or other liquids freely.

Two or three weeks later the attempt is again made to wean the infant, but in the manner previously indicated (p. 5). If the change to artificial food is made gradually, acute alimentary disturbances seldom occur. The idea of putting the infant back on the breast, if the cow's milk does not agree, does not occur to the mother, because she commonly believes that the milk is no longer good. This, however, is an

error. True, the milk has taken on colostral characteristics, but it is, nevertheless, very usable.

ALIMENTARY DISTURBANCES DUE TO PARENTERAL INFECTION

If in any portion of the infant organism, distant from the intestinal tract, that is parenteral, any form of severe infection manifests itself, i.e., pneumonia or la grippe, etc., the general constitution may become so seriously involved that the organism loses its tolerance to normal food.

The same food on which the infant has hitherto thrived very well now acts as a poison and readily produces all the manifestations of an acute and severe alimentary disturbance. This form of disturbance, according to Czerny-Keller, should be designated as alimentary disturbance, due to parenteral infection.

In practically every infection occurring during infancy, the intestinal tract is always more or less involved. In some infants, the body weight remains stationary, in others there is a marked decrease. Practically all suffer with anorexia; some become constipated, others, again, have diarrhea, and in a few, definite and severe alimentary disturbances arise. These many variations may often be observed, even in the most trivial infections of infancy, as, for instance, vaccination.

That all infants who become infected do not develop a complicating alimentary disturbance is due to certain favorable conditions.

In the first instance, the type of infection makes a difference. In 100 cases of parenteral alimentary disturbance which have come under our own observation, la grippe, or an affection of the upper respiratory

passages was, in 44 cases, the type of infection so complicated. In 26 cases, pyelo-nephritis indicated the seat of infection; in eight children, measles was the cause, and in six cases syphilis had been incurred. The remainder included pertussis, otitis media, meningitis, etc.

Of great significance is the age of the infant. Young infants react more readily with alimentary

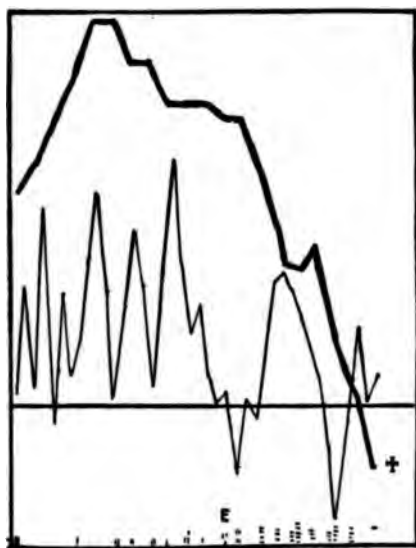


FIG. 14.—SEVERE PARENTERAL ALIMENTARY DISTURBANCE.

The infant was admitted on account of chronic broncho-pneumonia and received breast-milk from the beginning. At about the time that the pneumonia improved, cessation and decline in weight set in. As recovery from the pneumonia was had, diarrhea set in and the infant succumbed to an alimentary disease.

disturbances than older ones; premature infants more quickly than those born at full term.

The determining factor is the precedent feeding, both in respect to quantity and quality of the food given. Infants who have been fed large quantities of food, that is, who are overfed with carbohydrates exclusively, fare the worst.

The *clinical picture* of parenteral alimentary dis-

turbance is modified, in a degree, by the causal infection. These modifications, however, are not so considerable as to make their separate description necessary.

The *diagnosis* may offer considerable difficulty. There can hardly be a doubt that in cases with a clinically definite infection, to which a few days later the symptoms of diarrhea are added, we have to deal with two different and distinct infections.

The case is different, however, when the primary lesion remains undiscovered, and is, probably, remote and obscure, as, for example, in infection of the middle ear or the renal pelvis, and when, after several days of unexplained fever and other stormy symptoms, an alimentary disturbance appears. In these cases, it is well to remember that acute alimentary disturbances may, at times, have parenteral origin, and will not improve until the primary and fundamental infection has been removed.

The criterion which determines whether an alimentary disturbance is primary, or secondary to a parenteral disturbance, is the behavior of the temperature. In a pure, uncomplicated alimentary disturbance, the temperature, which in these cases seems to be digestive in origin, drops so soon as food is discontinued. In a parenteral disturbance, it is slightly or not at all influenced by a day or two of fasting.

The *prognosis* of a parenteral disturbance is always uncertain. There are, of course, many cases in which the disturbance clears up without any special treatment, if the primary infection is cared for. There is no certainty, however, in this respect; and it is well, therefore, to be cautious in the prognosis, particularly in the predisposed type of infant referred to.

Treatment.—The treatment must be guided accordingly. In every infection that befalls the infant,

attention should first be directed to the digestive tract. The quantity of the food should be reduced and the demand of the infant for fluids should be satisfied. This can be done by giving weak tea, mineral waters, or normal salt solution, but under no conditions, by giving milk as a beverage. If one is dealing with a predisposed infant, of the type already described, it is well to put it, as a prophylactic measure, on breast-milk or on protein-milk with small additions of sugar. If, in spite of these precautions, alimentary disturbance develops, one should not hesitate a moment, but should discontinue the food and inaugurate such a therapy as one would use in any alimentary disturbance of a severe degree.

ALIMENTARY DISTURBANCES EX CONSTITUTIONE

THE EXUDATIVE DIATHESIS

(CZERNY)

In older works on pediatrics the disease complex, scrofula, played a great rôle. With it were combined all manner of symptoms, some of which were distinctly of tuberculous origin and others which had no connection whatever with tuberculosis. The combination of these heterogeneous manifestations under the name of a case was always considered an unfortunate attempt which distinctly impeded progress and clouded understanding. Czerny's initiative brought about a radical change, which he made possible, however, only by casting overboard the name, together with the entire concept of scrofula.

Since then, all those symptoms which are clearly caused by the tubercle bacillus are classed under tuberculosis of childhood. Accordingly, we no longer

speak of scrofulous glands, or of bone and joint disease, or of scrofuloderma; but instead, of clearly localized tuberculosis. All the non-tuberculous manifestations Czerny conceived to be evidences of an infantile constitutional anomaly, to which he gave the name of the exudative diathesis, using the word diathesis as synonymous with a disposition or tendency to a certain form of disease.

In time, he enlarged the disease complex as he traced it to its earliest beginnings and exhibitions, while, at the same time, he pointed out its extremely important relation to the nutrition, so that to-day we not only reach a more intelligent diagnosis, even in the very young infant, but are able to influence the development of its symptoms, favorably or unfavorably, by the nutritive measures we adopt.

The term scrofula has practically disappeared from the nomenclature of modern pediatrics and is, at the present time, merely of historical interest.

The exudative diathesis appears very frequently in early infancy, as well as in later childhood. Not seldom it is found in all of the children of a family, and it may usually be determined, in such cases, that either the father or the mother, or both, were at some time or other affected in the same way. If in historical reminiscence the parents fail, one may, nevertheless, suspect the existence of an earlier exudative diathesis by certain residual phenomena, such as chronic pharyngitis, or catarrhal otitis media, or phlyctenular blepharitis, or the peculiar facial expression known as aprosexia nasalis.

Symptoms and Course.—So far as the bearer of the diathesis, the infant itself, is concerned, a marked contrast is frequently observed between it and its parents. The latter are often strong, robust indi-

viduals, the infant, on the contrary, is puny, thin and scrawny.

After feeding has begun, a train of symptoms manifests itself which, excepting for infants who are apparently underfed, affects only those who have the disposition to exudative diathesis. These symptoms culminate in the apparent failure of artificial feeding. In spite of an abundant quantity of food, the weight does not increase, but remains stationary for weeks and months. At first, one thinks of the possibility of a quantitative or qualitative deficiency of the food, but neither increase of quantity of artificial food, nor a change of wet-nurses, results in improvement, and proves clearly that the causes lie within the infant itself.

Not all infants with exudative diathesis exhibit this deficiency of weight under breast feeding. There is yet another type which shows really abnormal gains. The result of feeding profoundly impresses the layman. The physician, however, is not pleased with it, for the more pronounced the increase in weight, the more rapidly and intensively do other symptoms of the exudative diathesis develop. The manner of fat deposit differs from the normal in these infants. A constitutionally normal infant retains its firm skin and muscular tone, even if it becomes fat; but in the exudative infant the fat is soft, flabby, and the child assumes a doughy or pasty appearance.

These two types, the thin and the fat, are seen not only in infancy, but also in later life. Upon the foundation of this congenital tendency other definite symptoms develop, provoked partly by artificial feeding or irrational feeding, by consequent alimentary disturbances, or by infections. These symptoms manifest themselves in the skin, as seborrhea, crusta lactea,

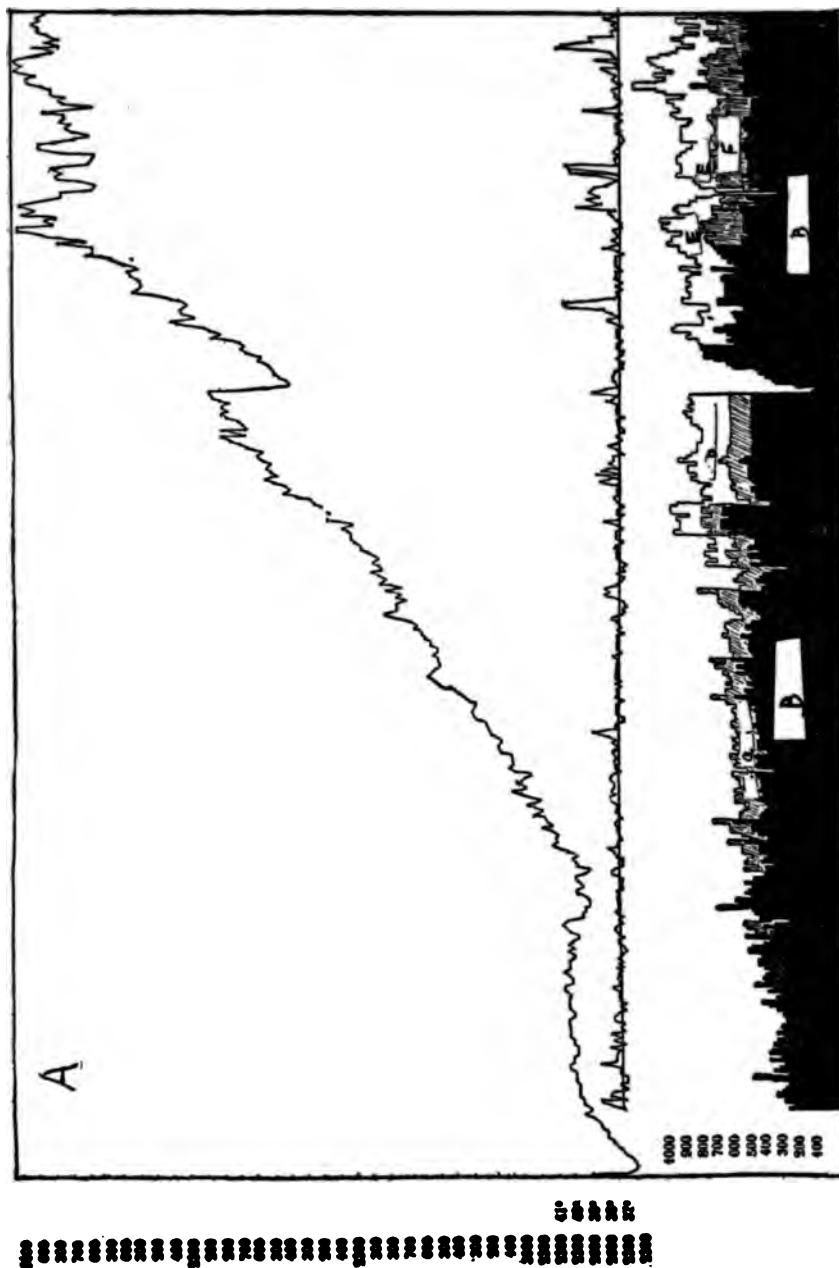


FIG. 15.—DEVELOPMENT OF AN INFANT WITH EXUDATIVE DIATHESIS.—Unsatisfactory gain on breast-milk alone. At the bottom of the chart the food quantity is indicated in grams. At the age of 2½ months the first attempt to feed additional food was made. It failed (weight loss). At 3 months it was attempted again, this time successfully. During the seventh month an attack of convulsions of obscure origin caused a temporary return to exclusive breast-feeding. The middle curve is the temperature curve. Its frequent rises indicate the repeated affections of the respiratory tract. The upper curve is the weight curve. Its frequent rises indicate the repeated increases in weight. With the beginning of mixed feeding the weight began to increase, but in a very irregular manner. A, failure of breast-feeding in exudative diathesis. B, breast milk. C, cow's milk mixtures. D, cereals and toast. E, gruel and vegetables. F, toast.

strophulus or intertrigo: in the mucous membranes, as geographical tongue, recurrent catarrhal conditions of the upper air-passages (rhinitis, pharyngitis, otitis, bronchitis, asthma), as phlyctenular keratitis, circular dental caries, balanitis and vulvitis, or finally, in changes in the lymphoid organs, the thymus, spleen, tonsils, and intestinal follicles.

Skin Manifestations.

Seborrhea represents an increased secretion of the fat or sebum in the skin. This causes the formation of grayish-brown fatty scales over the hairy portion of the scalp, particularly over the vertex. Even with the most careful attention and cleanliness, these scales cannot be prevented from forming.

Crustea lactea (Milch-Schorf, often called "Vierziger" in Germany, because it is supposed to last forty weeks), shows upon the cheeks. In the thin type of these children, it appears as a reddish, dry, scaly eruption; in the fat infant, it manifests itself in the form of an intensely red, weeping and itching eczema, which has a tendency to spread and affects the adjoining parts of the ears, chin and hairy portions of the scalp.

Strophulus confines itself to the trunk and extremities of the child. It consists of papules and vesicles which form in groups. They fade after two or three days, but remain palpable in the skin for a considerable time, as nodules of pinhead size. They affect preferably the extensor surfaces of the extremities and the back.

Intertrigo appears in the groin, the folds of the arms and legs, behind the ears, on the neck, and in the genito-crural folds. It occurs in spite of the most painstaking efforts at cleanliness.

A very severe indication of the exudative diathesis has been termed erythroderma (Leiner). The skin is intensely reddened, shiny, and dry, and at times shows extensive weeping surfaces, especially about the buttocks, the genitals and upon the inner surface of the legs. Over the rest of the body and the face there appears, simultaneously, a thick seborrheic eczema. Erythroderma occurs early, and even in breast-fed infants suggests a bad prognosis of the viability of the infant. Another peculiarity, very commonly found in infants affected with exudative diathesis, is seen in the character of the hair; it does not lie down smoothly upon the scalp, but stands up straight and bushy. Eosinophilia is often found in florid eczema.

Symptoms of the Mucous Membranes.

The same vulnerability manifested by the outer skin, is shown on the mucous membranes. Those of the respiratory tract seem particularly predisposed.

Naso-pharyngeal catarrh persistently occurs and is infinitely more frequent in infants affected with exudative diathesis than in normal babies. It forms one of the chief reasons why not only infants, but children in general, are brought to the physician. Such cases deserve particular attention. The catarrh is accompanied by fever, at times moderate, but again reaching very high degrees. (Fig. 15.) A corresponding degree of general constitutional disturbance and anorexia is observed. Nasal breathing is interfered with through the swelling of the inflamed mucous membrane, and this hinders the act of suckling. In the pharynx very little is visible—probably only a dryness and reddening of the posterior wall. The chief seat of the disease, the region of the posterior nares, is not visible.

After two or three days, the fever decreases, the catarrh lessens, and a grayish white secretion is discharged from the nose which flows down the posterior wall of the pharynx. A few days later, these phenomena also disappear and everything is again in order. Only the lymphatics, which drain the mucous membrane of the naso-pharynx, and which during the acute process have become enlarged, remain swollen for a time and are palpable, behind the sterno-cleido-mastoid, as pea or bean-sized nodules.

A week later, perhaps the same process is repeated. Again there is temperature, the nasal breathing is impaired, the pharynx is red and the lymphatics are swollen. So it continues. In infants, a week hardly passes in which they do not have a temperature for one or two days. Under these conditions the posterior lymph glands seldom recede to normal size, but remain chronically enlarged. For one experienced in diagnosis, this is an important finding. For if one is consulted for an infant who besides the elevation of temperature shows enlargement of the posterior cervical lymph nodes, one can definitely suspect an inflammatory process in the naso-pharynx; and this is particularly true if the infant suggests, at the same time, other symptoms of an exudative diathesis.

As with the pharynx, so with any other portion of the respiratory tract. There may be angina, laryngitis, bronchitis, and catarrh of the Eustachian tube, with extension to the middle ear. A certain regular course is generally observed in the seat or location of these catarrhs.

In the given infant, they occur preferably in some one characteristic place; for example, in one infant always in the pharynx, in another always in the bronchi. Many infants and children having an exuda-

tive diathesis show a peculiar condition of the tongue, the so-called "lingua geographica." On certain portions of the tongue, the exudation manifests itself in desquamation of the epithelium. This gives the surface a peculiar spotted appearance which changes from day to day; at times the areas being round, at other times occurring in straight strips or, again, in a wreath form.

In older infants who have teeth, a circular, greenish discoloration of the dentum close to the root of the upper four incisors appears. This marks the occurrence, later of a "circular caries."

The cornea of the exudative infant often shows the so-called conjunctivitis eczematosa or phlyctenulosa. This is often suspected to be of tuberculous origin, but until tubercle bacilli have actually been demonstrated there should remain doubt about classifying it with this infection. Tuberculous manifestations, generally, are not so easily influenced that they disappear in the course of a day, as may be true of phlyctenulæ if calomel is used.

Next to the mucous membrane of the respiratory tract, that of the gastro-intestinal canal most frequently manifests symptoms referable to the exudative diathesis. Pathological indications appear, particularly in infants in whom, added to the primary anomaly, a neuropathy is acquired. This same tendency to dyspeptic stools or to constipation has been fully described on an earlier page (p. 108).

The mucous membrane of the genital tract in exudative diathesis shows a tendency to recurrent vulvitis or balanitis.

Lymphoid Organs.

The group of the lymphoid organs are the spleen, the thymus, tonsils and intestinal follicles. In infants

affected with an exudative diathesis, they may hypertrophy under the influence of improper feeding, particularly when this leads to an excessive deposit of fat. In mild cases the spleen is palpable; in the more severe, the thymus and tonsils are enlarged and, at autopsy, are found markedly swollen. Peyer's patches and the solitary follicles are in similar condition. The enlargement of these organs is all the more striking, because it is always accompanied by a pronounced adiposis of the entire organism.

Formerly, hypertrophy of the lymphoid structures was looked upon as a disease *sui generis*, and it was called the status lymphaticus, or the status thymico-lymphaticus. Without doubt, these conditions are none other than manifestations of an exudative diathesis. This type of infant is susceptible to infections and to psychic disturbances. They are liable to sudden death (*mors thymica*).

THE RELATION OF EXUDATIVE DIATHESIS TO OTHER DISEASES

The disposition to the exudative diathesis, latent in the new-born, if awakened and once manifested, may be influenced by faulty feeding. It may be modified, also, by infection or by such other constitutional anomalies as the neuropathic diathesis.

It has been already said that these infants react abnormally even to breast-feeding, the most rational form of feeding we know. This is particularly true if the technique of feeding is improper. Exudative manifestations may be produced by underfeeding, but the chief factor of influence is overfeeding. It is a well-known fact that the body-weight does not always run parallel with the quantity of food taken.

Some infants remain thin in spite of overfeeding. Clinical observation has shown that the harmful ingredient in the food is the fat. This explains the peculiar behavior of the infant suffering with an exudative diathesis who is fed upon breast-milk. The child does not gain at all on the fat-rich breast-milk, or it shows a distinctly pathological accumulation of fat. This explains why the exudative manifestations are aggravated by overfeeding and improve if the quantity of milk is decreased and, in some measure, replaced by carbohydrates.

Czerny himself defines the exudative diathesis as a change in the chemistry of the organism which is caused by a congenitally low tolerance of the organism to fat.

It does not follow, however, that excessive feeding with carbohydrates, for the purpose of influencing the constitutional anomaly, is without evil consequences. For if in the use of large amounts of carbohydrate, marked increases of weight are had, the exudative diathesis is again influenced unfavorably. Clinical observation has further shown that the habitual use of eggs in the infant's feeding favors the development of its manifestations.

There is a definite relation between this condition and the liability to infection. Micro-organisms find a favorable soil for development in infants who are affected with an exudative diathesis on account of their lowered immunity. Their temperature curve is an unstable one, ranging constantly from the normal to varying degrees of fever, as Fig. 15, on page 184, shows.

On the other hand, the occurrence of infections may prepare the way for the development of the exudative diathesis. If, for example, such an infant is

vaccinated, or develops measles, or some tuberculous infection, the diathetic skin eruptions from which it had been previously free surely manifest themselves subsequently.

Still another form of inter-relationship is seen: An infant who is affected with an extensive weeping eczema, becomes ill from a severe infection, e.g., a pneumonia or cystitis; one frequently observes that the eczema fades away overnight, dries up, and disappears. This is a reaction which infections have in common with other severe diseases and nutritive disorders. The laity believes that in these cases the "rash or eruption has gone inwards."

The exudative and neuropathic tendencies alike probably grow out of a common soil of congenital defect. In the family history, severe neuroses are frequently revealed in the parents; and it is probably for this reason that, in the infant, the two anomalies complicate each other. Clinically, such a combination is of the greatest importance. It explains the genesis of diarrhea or constipation occurring in breast-fed infants afflicted with an exudative diathesis, these symptoms often arising from an intestinal irritation which in a constitutionally normal infant would be absolutely without effect. It accounts, also, for abnormal reactions of certain infants expressed in skin eruptions. If the normal infant experiences an itching of the skin, it will scratch once or twice and stop.

If a nervous infant is affected with strophulus or milk crust and experiences an itching in the affected area, it will not only scratch, but continue scratching until the blood comes, and the more it does it the more intense does the itching sensation become. If one considers this tendency of all nervous individuals to fall into extremes in all their reactions, one can

understand how infants who are affected with strophulus or with facial eczema may scratch themselves to the point of extensive bleeding, when only the administration of sedatives or narcotics will give them rest.

The *pathogenesis* of the exudative diathesis is not clear.

The eventual *prognosis* is good. Its manifestations may continue undiminished beyond infancy, but they gradually disappear during the later years of development. Children affected with this condition never can be looked upon as normal.

The *diagnosis*, after what has been said, should not be difficult. The earlier it is made the more easily the prophylaxis of the clinical manifestations becomes.

THE TREATMENT OF THE MANIFESTATIONS OF EXUDATIVE DIATHESIS

Dietetic Therapy.—If infants affected with an exudative diathesis show an arrest of development on breast-milk, one must always determine, first, whether they are receiving quantitatively adequate nourishment (as measured by Budin's rule). If this is not the case, the quantity of food must be increased according to the methods described on page 104.

If the feeding, however, is sufficient and if, in spite of this, no weight increase is observed, it is advisable to wait. In many infants, after a brief period, spontaneous increases will occur. Change of wet-nurse is useless, for the infant that fails with one will probably fail with another. There is no indication for weaning; more than that, it is dangerous, for it may lead to the rise of acute symptoms in the gastro-

intestinal tract. It is well to wait until the infant is older.

The best time to initiate supplementary feeding is at the end of the third month, and then but one breast feeding is, at first, exchanged for one of buttermilk, malt soup, or a mixture of one-third milk, two-thirds oatmeal water, with sugar. It is necessary to choose a carbohydrate-rich food, for experience has taught us that simple milk dilution with water is not successful. If with supplementary feeding there is no appreciable gain in the course of two or three days, one may look upon the effort as a failure. It should be discontinued and a return made to exclusive breast-feeding. Some two weeks later another attempt may be made, and is generally crowned with success.

On such a regime of four breast-feedings and one feeding of artificial food the infant is kept until it is six months old, when a cereal soup and some vegetable may be added. From that time on the feeding should correspond to that of normal infants.

It is a mistake to wean the infant, even if by so doing the daily weight increase is greater. It is precisely in this condition that large weight increases are least desirable. It is enough if the infant shows some gain, and this gain is usually guaranteed by the meal of artificial food, while the breast-feeding assures it the immunity which is characteristic of all breast-fed infants.

If, on the other hand, an infant who is breast-fed shows excessive gains in weight, it becomes necessary to curtail the quantity of food. An attempt may be made to shorten the nursing period of each feeding, or one may reduce the number of feedings to four. These measures are generally unsuccessful. In a little while the infant gets as much in four feedings as it

formerly did in five. The best procedure, then, is to resort early to *allaitement mixte*, say, probably by the third or fourth month. In such a case, for the carbohydrate-rich food, a broth with cereal or oatmeal, which is low in caloric value, should be substituted.

In the later months, when weaning is undertaken, full cow's milk should not be given. The quantity of milk should not exceed one-half liter a day. For example, at mornings and evenings, two hundred grams, consisting of one-half or two-thirds milk, with sugar, and diluted with flour soup, may be fed. In the forenoon, zwieback, softened in water, with about one hundred grams of milk; at noon only a vegetable, and, in the afternoon, a cereal soup may be given.

The treatment of diarrhea occurring in breast-fed infants affected with an exudative diathesis has been outlined in detail before (page 108).

Under artificial feeding, one also meets both types of infants affected with exudative diathesis, viz., the lean and the fat type. With such feeding, it is far more difficult to differentiate, through dietetic methods, whether one has to deal with a constitutional or an alimentary phase of disease. If an infant with an exudative diathesis gains slowly, one may be content with the fact of a certain measure of progress, sure that the older the infant gets the more satisfactory is its bodily development. It is not advisable to change the composition of the food much unless a definite disturbance due to an overfeeding with cow's milk manifests itself, when the same rules should be followed as in the general treatment of this condition.

In the other type, the fat infant, an attempt should be made to curtail the quantity of food considerably, as early as possible, and before any marked skin manifestations appear. Unfortunately, this attempt too

often fails, on account of the ignorance of the parents. Restriction in the amount of food given must be absolutely required if eczema appears and tends to spread, or if the initial manifestations of the status lymphaticus appear. It is not necessary that the infant should lose in weight, but there should be an arrest of growth for a considerable time. This may be accomplished by limiting the quantity of milk given and substituting for it carbohydrates; but, again, not in such amount as to lead to gain in weight. In these cases, also, the complementary feeding of broth and cereals or oatmeal and vegetables gives good results.

If one has to deal with an infant whose parents cannot be persuaded to diminish the food given, one must be content to allow the usual food, at morning, noon and evening, and to give only a bottle of water or tea in the forenoon and afternoon.

As a special dietetic measure in the treatment of infantile eczema, Finkelstein recommends his so-called "eczema soup." It is prepared similarly with protein-milk. The milk is coagulated; the coagulum and the whey are separated; the former is passed through a sieve several times and is then again mixed with one-tenth to one-fifth of the volume of the whey. Water or oatmeal water is substituted for the balance of the whey. The therapy with "eczema soup" is not without danger. If one wishes to use it, the directions given by Finkelstein should be explicitly followed. (*Therapeutische Monats. Hefte*, 1912, p. 34).

Medical Therapy.—One would entirely misunderstand the nature of the exudative diathesis if one should depend entirely on the dietetic therapy. Fully as important is the treatment of the catarrhal conditions of the upper air-passages and the local care of

the eczema. It is a considerable time before the feeding therapy shows its effect. If one should wait for it alone, it is doubtful whether the case would long remain in one's hands.

The treatment of catarrh of the mucous membranes in an exudative diathesis is similar to the therapy adopted in other diseases of the respiratory tract. The treatment of the hypertrophy of the lymphoid organs has been, up to the present time, purely dietetic. It will suffice to speak, in particular, only of the treatment of the exudative skin manifestations.

CRUSTA LACTEA

In the early form of this disorder, with dryness and cracking of the skin of the cheek, boric acid ointment, or Schleich's Cream (with borax), or Ung. Herb. compound (the so-called Vilja crème), may be used. If the redness increases, zinc paste, or Schleich's Cream with zinc, may be applied at bedtime without mask, or the skin may be painted with a Tumenol solution:

℞ Tumenol 3.0
 Glycerin,
 Zinc. oxid.,
 Talcum, aq. dest. āā. ad. 150.0
 Sig.—Shake well.

If there is much itching, the following ointment is good:

℞ Olei rusci 1.0
 Zinc paste 100.0

If the eczema is extensive and there is much scratching, one may use:

R	Tumenol	15.0
	Zinc paste	150.0
	Naphthalin	ad 200.0

If the eczema is infected, of very angry appearance, or covered with pustules, it is well to apply moist dressings of aluminum acetate for several days. Then the tumenol ointment may be used; and, finally, an ointment containing tar with some form of skin cream.

If there are multiple impetigenous areas, tumenol or red sulphur ointment may be applied.

If the infant has fever, no bandage or mask should be used; a closely applied dressing has, at times, been a cause of the so-called eczema death. Eczemas always do better if left open and exposed to the air. The infant's hands should be tied so it cannot scratch, and the ointments may then be applied without dressings.

SEBORRHEA

If the infant is inclined to much seborrhea, the scalp should be well rubbed, daily, with Vilja crème, or hydrolin, or boric acid ointment. Washing of the scalp will not remove the desquamating scales.

In neglected cases, with thick dry scales, an ointment of equal parts of vaseline and lead plaster may be applied. The softened scales are then scraped off with a spatula or a spoonhandle. The underlying scalp is generally deeply reddened. Plain zinc paste, or a paste with a little tar added, is applied until the reddened areas are somewhat blanched; and, after

this, the boric acid ointment is applied as previously described.

If the seborrhea is infected, or if the surface weeps, or is covered with pustular crusts, the head must be shaved. If there is much weeping, a solution consisting of silver nitrate, i.o, spts. ætheris, ad 100.0, is applied daily with a camel's hair brush, and a dressing of tumenol ointment is then used. Follicular abscesses are opened and treated with silver nitrate. As soon as the skin has dried under the tumenol ointment, the zinc paste may be employed.

To prevent the bandages or face-mask being torn off by the infant, the mother may make a muslin cap which can be pulled over the head and tied at the chin, leaving the face free. In the hospital, the treatment is much simpler. The infants are simply tied so that they cannot scratch, and all bandages are left off; the crusts are softened with castor oil, and a zinc ointment, with tar, is applied.

INTERTRIGO

Weeping intertrigo of the folds of the skin, behind the ears, and about the neck, is treated with wet dressings until the inflammatory symptoms cease. Weak silver nitrate solutions are then applied and later a tumenol ointment. After the surface has become dry, the tar-zinc paste or resorcin ointment may be used, until the infiltrated skin has softened.

℞ Resorcin	55.0
Zinc. oxid.,	
Vaseline	25.0
Lanolin	ad 100.0

The most aggravating intertrigo is that of the genito-anal region. The complicating eczema which arises easily on the predisposed skin and is favored by the constant irritation of feces, urine, sweat, etc., is particularly intractable. So long as the skin is only reddened, the infant is dried frequently and is not cleaned with water, but only with oil. Following this, zinc paste and, later, zinc powder, is applied. If the eczema weeps, it is first treated with silver nitrate and then the zinc paste is used. In severer cases and also in the so-called erythrodermas, the daily bath is entirely discontinued. If there is tendency to a weeping surface, tannic acid baths are useful. If there is a tendency to seborrhea, bran baths are good. The intertrigo behind the ear yields with difficulty. A weak yellow oxide of mercury ointment or white precipitate ointment is effective. The skin must not be washed.

STROPHULUS

For the irritating eruptions of strophulus and prurigo, an ointment containing beta-naphthol, or 5 to 10 per cent. of bromokol is good. The itching is frequently relieved by the application of menthol spirits, 5 per cent., or acetic acid solutions, or the application of lemon juice. Tannic acid or potassium permanganate may be used in the bath.

Baths.

Tannic acid, two pounds of oak-bark, is put into four liters of water and boiled for one hour. The liquid is poured off from the bark into four bottles. One bottle is added to each bath. The baths should be given two or three times a week.

For *tannin baths*: A package of tannin weighing twenty grams is added to each bath.

For *bran baths*: Three or four handfuls of bran are placed in a bag and this is immersed in one liter of cold water. This is boiled for one-half to one hour, a few pieces of wood being placed in the bottom of the vessel so that the bran does not adhere. The infusion is then added to the bath.

For *potassium permanganate baths*: Ten grams of potassium permanganate is dissolved in a bottle of water; enough of this solution is poured into the bath to color it a deep burgundy red. The infant is kept in the bath for a long time. After several baths, its skin will turn a dark brown.

Internal Medication.

Internal medication consists only of sedative remedies through the use of which the infant, tormented by the intense itching, gets some sleep.

Sol. chloral hydrate, 2.0 to 100.0. Dose, one, two or three teaspoonfuls, in the evening; or veronal, 0.15 grams to a dose, may be used.

Arsenical preparations may be tried. Recently atropin has been employed with considerable success for exudative skin manifestations, as well as for chronic bronchitis and broncho-pneumonia of infants with exudative diathesis. A solution of atropin sulphate (1.0 to 1000.0) is used in drop doses, steadily increased until a total of fifteen drops a day is reached.

It can be given beyond this dose. Increased pulse rate and dilatation of the pupil indicate when the maximum tolerance has been reached. Infants tolerate atropin very well. They have taken as high as 50 drops a day (Krasnogorski).

It is absolutely necessary to prevent the infant

affected with eczema from scratching. The finger nails must be cut; mittens must be pulled over the hands; splints or starched cuffs may be sewed into the sleeves of the jacket. When the infant is in bed, the hands may be tied to the sides of the crib.

RACHITIS

Occurrence.—Rachitis is a disease of the widest distribution. Some 80 per cent. of infants are affected. It occurs throughout the period between the second month and the second year of life. It appears also in later life in the form of rachitis tarda and rachitis adolescentium.

Etiology.—Rachitis develops upon the basis of a congenital disposition, very probably in the form of a diminished calcium content of the infant organism, as compared with the normal (Czerny).

Its appearance is favored by a series of predisposing factors, among which the following are well recognized:

(1) *Nutritive and Alimentary Disturbances.*—On the one hand, it is an undisputed fact that rachitis can be produced by improper feeding; and, on the other hand, that it can be cured by measures which in their therapeutic effect are of a purely alimentary character. It is an extremely frequent disease in overfed infants, and especially in those who have been very early fed upon full cow's milk and show other symptoms of disturbance due to the overfeeding of cow's milk. Atrophic infants are very infrequently affected. Artificial feeding per se, very commonly furnishes a predisposition to rachitis. Breast-fed infants are nearly immune. If they are affected, other factors than the feeding are at fault.

(2) *Premature Birth*.—If rachitis arises upon the basis of a congenital deficiency of calcium salts, it should be particularly noticeable in premature infants; for the deposit of calcium and, for that matter, all of the salts in the infant organism, takes place chiefly in the last two or three months of fetal life. If this process terminates too early, through prematurity of birth, a certain deficit of calcium necessarily obtains in the organism. It is a fact that premature infants, almost without exception, show some form of rachitic disease.

(3) *Congenital Defectiveness*.

(4) *General Hygienic and Climatic Factors*.—Rachitis is hardly ever observed during the summer months. During the winter, however, nearly every infant who comes under the observation of the physician shows some manifestation of pronounced rachitis. The explanation of this seasonal phenomenon is still not quite clear.

The environment and the general mode of living favor its development. Aborigines are free from rachitis. If, however, they are placed under the influence of civilized conditions, are, so to say, domesticated, they develop unusually severe manifestations. The African negro, for instance, shows absolutely no rachitis, while it is extremely common among the American negroes.

In animals, the influence of domestication is very well shown. This has been particularly observed in wild animals kept in menageries and in hunting dogs who are kept chained for long periods.

Symptoms and Course.—Under the influence of one or another of the factors mentioned, rachitis develops. We must look upon it as a general disease, although

among its symptoms those which affect the skeletal system are particularly in the foreground.

(1) *The Development of Rachitis*.—At first general symptoms appear, which recur with a certain regularity and may be looked upon as prodromal symptoms of rachitis. These are principally disturbances of a nervous type, in part of vaso-motor origin, but also interpreted as increased restlessness, peevishness, disturbed sleep, hyper-sensitivity to touch, etc., of particular note is a peculiar dermatographia. Wherever the palpating finger touches the skin a red spot will remain. The moment the infant cries, the head veins become congested; the body takes on a blue discoloration and is immediately covered with sweat. Even when the infant is at rest, a pathologic degree of sweating is noticeable.

Every infant sweats during the nursing period and during sleep, but in the rachitic infant, the entire pillow is drenched with sweat. If the infant is one who has learned to sit up or stand, the parents report that it no longer shows inclination, nor seems to have the strength to do so. These findings, particularly if present during the winter months, should leave no doubt in one's mind that one has to deal with a case of incipient rachitis.

(2) *Mild Degree of Rachitis*.—Of the bone symptoms, the first to appear is cranio-tabes. By this is meant a softening of the cranial bones, particularly over the occiput in the rachitic infant. This can be felt by placing both hands against the temporal bones and palpating the region of the lambdoid suture with the finger-tips. The tabes is either bilateral, or unilateral; if the latter, it generally involves the side upon which the infant prefers to lie. The closure of the fontanelle is halted; its margin becomes soft,

and it gradually begins to enlarge. At the same time, the rosary appears at the thorax; by which is meant an enlargement of the ribs at the costo-chondral junction. Epiphyseal enlargement of both wrists and ankles also appears.

In this state the infant is most frequently brought to the physician. From the enlargement of the fontanelle and the double joints (the epiphyseal enlargements), an experienced mother will have made the diagnosis of rachitis or the English disease. However, if the condition is not recognized, the disease of the bone ultimately assumes a more severe grade and other parts of the organism become involved.

(3) *Severe Rachitis.* (a) *The Head.*—Cranio-tabes becomes very extensive and eventually involves all the other cranial bones, so that the head assumes the consistency of a hard rubber ball; a mild degree of hydrocephalus develops and separates the soft cranial sutures. The limitation of the fontanelles disappears, and they do not become closed until far into the second year of life; while the bones of the posterior occiput become softened. The frontal bones become decidedly thickened; so-called bosses form and the head assumes the type of the caput quadratum.

(b) *The Face.*—In the rachitic infant the maxillary bone and the lower margin of the submaxillary bone protrude, while the alveolar portion of these bones inclines inward. This limits the space for the teeth and accounts for their abnormal position when they erupt. The teeth do not erupt in pairs, as normally, but come through singly. They are frequently soft, grooved and notched, showing a yellow discoloration, and easily become carious.

(c) *Thorax.*—In addition to the rosary, the thorax frequently exhibits the so-called rachitic pigeon-

breast. The lateral walls of the thorax become flattened; the back shows a scoliosis or a kypho-scoliosis, and the lower edge of the thoracic wall flares outward.

(d) *The Pelvis*.—The pelvic brim displays the rachitic changes which in later life have such vital consequences.

(e) *The Extremities*.—The extremities soon show, besides the epiphyseal swellings already referred to, marked curvatures of the long bones. These are largely caused by muscular pull and stress. At times, there is separation of the continuity, but fractures are generally infrequent. More characteristic of rickets, are the so-called infracted bones producing coxa vera, bow-legs, X-legs, etc., as common manifestations. The phalanges of the fingers are thickened and become club-shaped.

These bony changes need not involve the entire skeletal system with equal intensity. It frequently occurs that only a pronounced rachitis of the cranial bones exists, while changes in the rest of the organism are not pronounced. In the same way, it may occur that only the thorax or the extremities show particularly marked involvement. In whatever degree, the condition is one and the same. The physical state of the infant is always somewhat involved.

In the breast-fed infants rachitis, however, seems to occur only in the mild form. Among the artificially-fed infants attacked, the fat, pale, pudgy individual is particularly apt to be affected. The musculature is always fully developed, but is soft and flabby and has very slight tone. The tendons are flaccid and allow of an abnormal mobility of the extremities. The tone of all tissues is deficient, although the soft parts maintain their contour. This is not due to firmness of skin, but to superfluous fat.

These conditions all serve to aid in the development of the kyphosis, the flat-feet, the genu valgum, and the protuberant abdomen of the rachitic child.

The digestive tract shows no symptoms peculiar to rickets. Of course, every rachitic infant may have diarrhea along with its other symptoms, but the alimentary disturbance frequently described as a special and peculiar symptom of rickets has really no connection with this disease. Alimentary disorders, as such, however, and especially nutritive disturbances, play a peculiar rôle in the etiology of rachitis.

If not so important, in a symptomatic sense, the nervous system shows a greater involvement. The disposition of the infants is decidedly affected. The mere sight of a physician, or of any stranger, and sometimes a mere touch causes them to cry out with fear. This has led to the belief that they suffer spontaneous bone pains. Forced to lie continually on the back on account of the disease, their mental prospect is limited and their intelligence is somewhat less developed than that of normal infants. Their sense of smell and taste is frequently impaired. Formerly some of the spasmophilic phenomena, as, for example, laryngo-spasm, were considered symptoms of rickets. While they are not so regarded to-day, it is, nevertheless, a common occurrence that spasmophilia and rickets are associated.

Certain other symptoms are noted in the rachitic infant, although it is not clear, at the present time, whether they are a part of the disease picture or are merely incidental to it. Among such symptoms are an enlargement of the spleen and a form of anemia.

Complications.—The most dangerous complications of rachitis are respiratory diseases. The lung in the rachitic infant, to begin with, works under

difficulties. At every depression of the diaphragm during inspiration, the soft ribs yield. This lessens the ventilation of the lung, so that these infants continually suffer for want of proper aëration. So soon as the slightest catarrh occurs, these conditions are much aggravated. The embarrassment assumes an extreme degree in such a complication as pertussis or capillary bronchitis. If these complications occur with rachitis, the prognosis is almost always fatal.

A peculiar phenomenon has been observed in some rachitic infants,—a monotonous and continuous lateral rolling of the head on the pillow, the so-called *spasmus rotatorius*. This may be combined with a *nystagmus*. The cause of this phenomenon lies in the fact that over the infant's head, or possibly behind it, there is some shining object, as a window or a mirror, which the child attempts to see. Its effort to turn the head in this direction causes the spasm, which, if it has not been long-continued, may be relieved by simply changing the position of the bed in such a way that the child can see the object. In some cases the spasm continues for weeks. No particular treatment for it is necessary.

There are some infants who, apart from other rachitic symptoms, have a great tendency to fractures of the bones. They are not merely *infracted*, but suffer actual breaks. At times, five or six fractures appear simultaneously in as many different bones. Sometimes, in the entire course of the disease, there may be as many as twenty or thirty. In most cases, a marked defect of the intelligence of the infant is also present. This condition is generally considered as a separate entity from rachitis, and is termed *osteopsathyrosis*.

The *diagnosis* of rickets is not difficult when one

considers the abundance of symptoms. In spite of this multiplicity, doubt sometimes arises and, for this reason, it is well to bear in mind that a slight bowing of the tibia outward is physiologic, and that soft cranial bones and gaping fontanelles in young infants do not necessarily have any connection with rickets. Where marked pains are present in rachitic bones of the extremities, one may be led to suspect Barlow's disease. The rare developmental disturbances of infancy, such as a myxedema, mongolism and mycromelia often sail under the false flag of rachitis.

The *prognosis* is good if the treatment is carried out according to scientific principles. Even bony deformities retrograde considerably by the time school age is reached. The bow-legs disappear to a very large degree, as does the kyphosis. The scoliosis tends to remain; and this in connection with the pigeon-breast, the rachitic pelvic brim, the caput quadratum, the large head and a few other symptoms are evidences that the disease has been present in infancy. The prognosis becomes worse if respiratory diseases complicate the picture, or if such infections as measles or pertussis occur, and these, again, on account of their intimate relation to the respiratory tract.

Pathologic and Anatomic Changes in Rickets.

For the most part, the thickening of the bone is had through the perichondral growth of newly-formed bone, while simultaneously the resorption of the old bone takes place within the medullary canal. In rickets the bone apposition is disturbed and only soft osseous tissue poor in calcium salts is formed. The resorption from the medullary canal continues, however, and is, at times, even increased.

The growth in length is caused by the excess deposit, at the epiphyseal margins, of layers of cartilaginous cells. These are separated from each other by the so-called cartilaginous interstitial substances. In the latter, provisional calcification takes place, by which the bone, at this particular point, receives a certain amount of support. From the direction of the diaphysis, the cartilaginous cell layers are met by a space containing marrow. In this marrow zone, the cartilaginous cells disappear. It is here that the interstitial substance of the bone is formed. This finally becomes calcareous and the provisional calcareous area becomes merged with it and disappears.

In rickets there are marked changes from this normal physiologic course of the bone growth. At the epiphyses, an abnormally marked proliferation of cartilaginous cells takes place, making a sort of swelling. This is what we clinically designate as epiphyseal thickening.

The provisional calcification does not occur. This disarranges the order and continuity of the cartilaginous cell columns. The marrow spaces are also thereby deranged and the ultimate calcification of the bone-cells does not take place. The result is the thickening and softening, even macroscopically noticeable, of the rachitic bone, reaching sometimes degrees as marked as those found in osteomalacia.

Pathogenesis.—To explain the pathogenesis of rickets, many theories have been advanced. This is not the place to discuss them. They are all based upon the fact that chemical examination shows that the rachitic bone is more deficient in calcium than is the normal bone. The calcium content of the normal bone, according to Brubacher, is 5.42 per cent.; in the rachitic bone it is 2.98 per cent.

The most plausible explanation for this deficiency of calcium would be that the infant receives too small an amount of calcium in its food. This possibility has been much discussed and experimenting investigators still maintain that this is actually the case. The clinicians, however, have always doubted the fact. In the first place, the experimental softening of the bones which it has been possible to bring about by feeding animals food deficient in calcium is not a true rickets. Furthermore, the feeding to the infant of breast-milk, which has only very small amounts of calcium, does not in itself lead to rickets, but, on the contrary, offers the greatest protection against it. It is only exceptionally that breast-fed infants are affected with this disease. Over against this fact, the most severe degree of rickets is observed in infants to whom we give the most calcium-rich food we possess, namely, undiluted cow's milk, in large quantities. It would seem, then, that the assumption of a primary calcium deficiency cannot be looked upon as a cause of rickets.

A more plausible cause would seem to lie in the assumption that a secondary calcium deficiency exists; that is, that the organism becomes deficient in calcium because of its pathologically increased excretion. This, in fact, would explain all those cases which develop in connection with indisposition due to over-feeding with cow's milk. As we have said before, there is, in these cases, very frequently, a negative calcium balance, more calcium being excreted than is taken into the organism with the food. If this increased excretion extends over weeks or months, the organism must finally become deficient in calcium.

While this explanation reconciles itself better with clinical facts, it does not give an altogether complete

explanation. It does not, for instance, explain why rickets so seldom occurs in the summer-time and is so common during the winter months.

Metamorphic experiments indicate that the disease begins a long time before it can be clinically demonstrated. For a period the metabolism is abnormal, and yet the infant appears well. It takes a certain time before the bony changes have reached a point at which they can be readily diagnosed. A second important result of chemical investigation is in the showing that the bone and the muscular tissue of the rachitic organism contains more water than in the normal. This is a very important fact. For, as we have previously explained, the water-content of the organism has a direct relation to its immunity. The more water the tissues contain, the less is their immunity. This possibly explains the fact that rachitic infants become otherwise ill much more frequently and are more severely affected by infections than are normal infants.

Treatment.—The results of the therapy of rachitis are very gratifying.

FEEDING THERAPY

The first consideration must be given to the feeding therapy. If rickets occurs in breast-fed infants, errors in the technique of the feeding must be sought and corrected. The number of feedings should be reduced to five in the twenty-four hours and all additions to the breast-milk, such as toast, cakes, etc., must be forbidden. It is well to discontinue exclusive breast-milk feeding quite early and begin the *allaite-mixte*. If necessary, a feeding of artificial food may be added as early as the third or fourth month.

An oatmeal soup may be given, prepared in the following manner:

Twenty grams of oatmeal, well boiled in 250 grams of broth, with vegetables and seasoning added, and the mixture then strained through a coarse sieve.

In older infants, in place of this soup, some cereal is given as early as the fifth month. It is a mistake to wean the infant entirely. With these changes in the diet, the rachitic manifestations will generally disappear in the course of one month.

In premature infants, who, as experience teaches us, are very frequently affected with rickets, it is well to begin the feeding of some vegetable soup or similar material as early as the fourth or fifth month, even though no rachitic symptoms have appeared.

In the artificially-fed infant, again, the kind of feeding must first be determined and corrected according to the instructions given in Part I.

Where some evident nutritional disorder exists it should be treated according to the rule in such cases. Generally, it is a case of disturbance due to overfeeding with cow's milk. In this event, a correction of the feeding, in a limitation of the quantity of milk or an exchange for part of it of some carbohydrate material, is indicated. Eventually, a change to malt-soup will often be sufficient, in itself, to relieve the rachitis.

In severe cases, one should begin the additional feeding of cereals and vegetables as early as the fifth month.

The weight of the child will, of course, be decidedly influenced by this change in the feeding régime. Some decreases will occur. This can be easily explained and is without significance. It is well, however, to prepare the parents for such a

decline, as they attach a great deal of importance to the results of the weighing, and very easily lose confidence in a physician if the reading is not as favorable as they expect.

Medicinal Therapy.

If an infant is fed correctly, according to its weight and age, and a rachitis develops nevertheless, it is sufficient to give one teaspoonful of phosphorized cod-liver oil, twice a day. It is advisable, in any event, to give all artificially-fed infants a little of this special remedy.

It must be very distinctly stated that the cod-liver oil will be efficacious only if errors of feeding are also corrected. To correct the feeding, without giving the oil, will give excellent results in many cases. To give the oil, however, and fail to correct the feeding, is never successful. The cod-liver oil is prescribed as follows: Phosphorus, .01; oleum morrhuæ, 100.0; sig., one teaspoonful twice a day. It is unnecessary to give a larger dose, as experience has taught us that it does not give better results and is generally passed unaltered in the feces.

Cod-liver oil is a popular remedy which dates back to olden times. The combination used to-day dates back to some investigations which Wegner undertook at the request of Virchow, in 1872. These showed that phosphorus circulating in the blood caused a fermentative stimulation of the osteogenetic tissues. These investigations have not been challenged by later authors. They are responsible for the use of phosphorus in bone diseases due to rachitic changes. The active principle is, undoubtedly, not the phosphorus, but the cod-liver oil. The infant seems to have an exceptional tolerance for this form of fat.

The phosphorus could be left out of the prescription; nevertheless, it is customary to prescribe it. The conception still holds that the phosphorus may possibly have some influence on the nervous symptoms so common in rickets. Metabolism experiments have definitely shown that the ingesting of phosphorized cod-liver oil will increase the retention of calcium if the food combination given is correct. It should be given for several weeks. The relief from the rachitic condition manifests itself first in an improvement of the subjective state of the infant. After three or four weeks, the occipital portions of the skull become much firmer.

Very few infants dislike the cod-liver oil. Any apparent dislike is mainly in the minds of the parents, who associate with it a tradition of distaste. If the infant refuses it at first, it is well to pour half a teaspoonful of the oil into the mouth and immediately afterward give the bottle.

In time, they will become accustomed to it. Older infants frequently look upon it as a delicacy.

Substitutive preparations, and especially Scott's Emulsion, are not so effective as the cod-liver oil and, under ordinary conditions, should not be used.

The giving of calcium preparations in rickets is useless. If a calcium preparation is combined with the phosphorized cod-liver oil it is supposed to hasten the cure. Clinically this is not demonstrable.

In addition to this therapy, one must aim to provide for the rachitic infant, as one would for other cases of chronic ailment, the best possible environment. It should be kept in the fresh air as much as possible and should be bathed once or twice daily. If there is much sweating, alcohol or spirits of camphor, etc., may be rubbed on the skin.

Salt baths, formerly used so much, are only to be employed in fat infants who are not affected with eczema.

Residence on the sea-coast or high altitudes is not necessary for the cure of rickets. It can be cured after proper treatment is initiated, amid the most destitute surroundings. If it is not relieved, it is chargeable to carelessness in carrying out the instructions of the physician, rather than to the fault of the environment. For this reason, it is unnecessary to send the infant away from the city or to a sanatorium. While the physicians there thoroughly understand balneo-climatic therapy, they have not the least conception of infant feeding.

In the personal care of rachitic infants, it is well to avoid carrying them around much. They should not be held in any one position. Generally speaking, they should lie upon a hard mattress, filled with horse-hair and without a pillow. If they sit up spontaneously they should not be hindered in the attempt. For older children with rachitis, the rocking-chair devised by Epstein is a good thing.

In rachitic infections all bandages and dressings should be omitted. The skin heals more quickly without them. Many infants, even with slight degrees of rickets, will have flat feet. Later they will learn to stand, but will have difficulty in walking. It is necessary to devise for them an especially constructed shoe.

ANEMIA

Anemia rarely occurs in the infant. Many infants are pale during the first year of their life, but the normal color of the mucous membranes in these cases convince one that it is not a true anemia we are

dealing with, but rather an angiospastic pallor of the external skin layers.

A true anemia is found in breast-fed infants who have been so fed exclusively for a long period, say one year and over. It is also found in the premature infant and in some children affected with hereditary syphilis, tuberculosis, and rickets. The most severe cases are found in the second year, especially if they have been artificially fed and have had repeated alimentary disturbances. Not necessarily are there any pronounced errors in the feeding and no definite organic disease may be demonstrable. Nevertheless, they may seem to be affected with an unusual degree of anemia.

In examining the anemic infant one finds pronounced pallor of the skin and mucous membranes, with diminution of the hemoglobin content and the number of red blood cells. Pathological varieties of the latter may occur. The skin often shows a waxy pallor with a slight tinge of greenish yellow. There is a tendency to hemorrhage in the tissues even with very slight traumata. The musculature is flabby; the adipose tissue is often very well developed. The heart gives murmurs which disappear as the condition is relieved.

Certain cases are marked by the occurrence of a large splenic tumor. Formerly these splenic cases were looked upon as a special disease entity and were given the name of pseudo-leucemia infantum of von Jaksch. At the present time, however, they are no longer so distinctly recognized.

Pathogenesis.—Anemia may be partly of constitutional and partly of alimentary origin. Our conception as to the pathology of its occurrence dates back to the investigations of Bunge. He found that

new-born animals were born with a certain iron deposit in the liver. This was apparently provided to make up for the definitely small amount of iron in the mother's milk. The moment this supply is used up, the animals instinctively begin to eat green vegetables. On the contrary, guinea-pigs, who apparently do not have such an iron-storage at all, begin to eat green vegetables from the moment of birth. In rabbits this store is sufficient for about three weeks, then the animal is obliged to take green fodder.

In the human infant, clinical experience has taught us that the period at which we should begin additional feeding lies between the sixth and the ninth month. If the infant receives breast-milk exclusively beyond this period, it becomes anemic. An earlier impoverishment of the organism in iron must necessarily follow, if through any congenital anomaly in the constitution of the organism the iron supply is insufficient. With an initial poverty of iron, the occurrence of anemia can be very easily accounted for, but its occurrence is not, in itself, sufficient proof of the lack.

Anemia may also result from the unbalanced feeding of cow's milk. In most severe degree it is sometimes met with in artificially-fed infants. *Ex juvantibus*, one must not conclude that it is merely a case of the deficiency of the milk in iron, for, if it were, the addition of green vegetables should immediately prove efficacious—which is not true. We must infer that the cow's milk-feeding involves, also, a directly harmful effect upon blood formation. It will not do simply to give vegetables along with the milk. The latter must be discontinued entirely and food rich in iron must be substituted.

The *diagnosis* of anemia is made by blood examination.

The *prognosis* is generally good unless intercurrent infections develop.

Treatment.—As a matter of prophylaxis infants who, according to experience, are predisposed to anemia, as, for instance, the prematurely born, should be fed earlier than usual with semi-solid food.

If anemia already exists, the milk should be reduced decidedly in quantity and, at the same time, semi-solid food, rich in iron, should be added. For example, in the morning, 200 grams of a mixture consisting of equal parts of milk and oatmeal, with sugar; in the forenoon, zwieback, softened with water, or fruit (scraped bananas) given from the spoon; at noon, broth and cereal; rice, groats, mondamine, or sago; or vegetable, with which a small amount of scraped meat or beef juice has been mixed; in the afternoon zwieback, softened in water; or cereal, with fruit; in the evening, again, milk and oatmeal water. In this way the quantity of milk can easily be reduced to one quarter of a liter.

In individual cases, injections of defibrinated or whole blood have been given.

Thirty c.c. of human blood are taken from the vein of the forearm under aseptic precautions. This is caught in a sterile glass bulb containing some glass pearls. It is shaken in this bulb for about ten minutes, which completes defibrination. The defibrinated blood (5 to 15 c.cm.), is immediately injected into the gluteal muscle. The injection may be repeated.

Remedies which may be given, in addition, are the preparations of iron. Saccharated carbonate of iron, ferratin, etc., one gram, twice daily. Preparations of arsenic may also be used.

THE NEUROPATHIC DIATHESIS

Under the terms psycho- and neuro-pathy are grouped all those conditions which depend upon either an increased or a diminished capacity for reaction of certain portions of the nervous system (Czerny). From this large group certain disease complexes may be separated out. They develop upon an identical basis the neuropathic disposition stated. They are individual and definitely distinct disease complexes. They will be discussed under the following heads:

- (1) Neuropathic Diathesis in General.
- (2) Spasmophilia.
- (3) Pylorospasm and habitual vomiting.

THE NEUROPATHIC DIATHESIS IN GENERAL

Nervous infants may be found, even as early as the first year of life. They are not at all rare and they certainly demand the attention of the physician. They are always the offspring of nervous or intensely psychopathic parents.

They make their presence felt unpleasantly, even on the first day of life, by their excessive restlessness. The normal infant sleeps almost the entire period of its very young days. The neuropathic makes itself heard very early. From the very first, it constitutes an exception to the rule that infants should have no food during the first twenty-four hours of their life. It must receive, at least, some hot water or a little weak tea. This restlessness continues. The parents, of course, always interpret it as a hunger-sign, especially if the balance shows that the weight

increase is behind that of the normal infant, a failure which is due entirely to the restlessness of the infant and to the increased energy consumption it causes. The second symptom is also interpreted by the parents as evidence of insufficient feeding.

The normal child will usually go to sleep after the feeding; but the neuropathic infant will continue restless and will not sleep or content itself until it gets its finger or the pacifier into its mouth or until it is taken up and rocked or carried around. If it finally goes to sleep its sleep is often interrupted by sudden jerking, or by movements of the arms; and it awakens at the slightest sound.

If a normal infant sleeps, adults who happen to be in the room can carry on a loud conversation, but a nervous infant is immediately aroused. Such an infant not only does not feel the desire to sleep, but it lacks, also, soundness of sleep. When it is awake it is remarkable how easily it is frightened. If any one comes near the bed, it is scared. It is generally very receptive, so far as vision and hearing are concerned, is agile and active, shows early maturity, quickly accustoms itself to conversation and likes to be waited upon. It tyrannically demands, to the last degree, any concession which once has been made to it in any respect.

The result is that it very rapidly develops into a small tyrant to whom the household must absolutely submit. To this viciously wrong disposition is generally added a very pernicious training on the part of the parents, incident to the fact that they are nervous, inconsequential individuals themselves and possessed of very little will-power. Physically speaking, nervous infants are generally thin, and hypertonic, of good musculature, but with a very deficient panniculi-

culus adiposus. Their static functions develop early. They soon learn to lift the head and are able to stand up before they are able to sit. When they are excited, either pleasantly or unpleasantly, they frequently exhibit a laryngismus stridulus. Many of them have periodic vomiting and almost all of them suffer with a combination of exudative diathesis of severe degree.

It must be clear that in infants so sensitized, all reactions manifest themselves in an exaggerated degree and, therefore, all manifestations must be reduced to their actual value. Neuropathic infants should be habituated from birth to regularity in sleeping and feeding. In particular, they should not be fed during the night; otherwise they are apt to be awake all night. With their tendency to precocity, their mental development should be retarded, rather than encouraged. One should religiously keep optical and acoustic excitants away from them. If they are especially restless, it may be wise to allow them certain harmless concessions, if these have an actually beneficial influence toward quietude. For instance, it is well to allow them to have the pacifier. One of small size, with a horn band and a ring, which will not constantly fall out of the mouth, should be chosen. The pacifier filled with sugar is, of course, forbidden.

It is permissible to allow feeding, experimentally, every three instead of every four hours. When they are ill, they show many symptoms, such as restlessness, or the irregular gains in weight, vomiting—a not infrequent occurrence in such infants—constipation, or diarrhea, which should not give any large degree of concern. At any rate, it is well to avoid any polytherapy with these cases. (See page 108.)

When they are ill, one should not overestimate

their symptoms; but, on the other hand, it is well with such highly sensitized infants to be somewhat on one's guard and prepared for all emergencies. A *prognosis* should always be more warily made, and more carefully given than in infants who are constitutionally normal.

THE SPASMOPHILIC DIATHESIS

No period of life is so predisposed to convulsive manifestations as is infancy, and within this period it is in the first and second half year of life that convulsions are most likely to occur. So common are they during this period that, for a long time, they were considered not as a pathologic, but rather as a physiologic phenomenon, explainable by the undeveloped functional activity of the inhibitory mechanism of the cerebrum. This view is no longer held. Convulsions under any and all circumstances are now looked upon as a pathologic manifestation.

In the large group of infantile convulsions, one type stands out prominently, the most important in frequency of its occurrence, clinically, and the least distinctively recognized—the type of spasmophilic convulsions.

By the spasmophilic diathesis of infants we understand a constitutional anomaly, consisting in a hyperirritability of the nervous system which is demonstrable by measurable electric stimuli and which creates a pathologic tendency to partial and general convulsions of both clonic and tonic type (Thiemich).

Etiology.—The convulsions and other similar manifestations develop upon the basis of a congenital neuro- and psycho-pathic constitution. Their immediate development is influenced by certain factors.

(1) *The Feeding*.—Practically no breast-fed infants show spasmophilic tendencies. They are confined to the artificially fed. The mere fact of artificial feeding seems sufficient to cause convulsions in infants affected with a spasmophilic diathesis.

(2) *Alimentary Errors*.—In other infants, certain errors in the technique of feeding are enough to develop symptoms which reveal the spasmophilic disposition. Overfeeding or unbalanced feeding are in point. Acute alimentary disturbances may lead to the exhibition of spasmophilia.

(3) *Seasonal Relation*.—Spasmophilic convulsions show the striking peculiarity of occurrence during the winter and spring months. In summer they cease almost entirely. Their occurrence follows a curve whose highest point lies in the period between Christmas and Easter.

(4) *Intercurrent febrile infections*, such as influenza, pneumonia, etc., are exciting causes.

(5) *The Factor of Age*.—The period within which spasmophilic phenomena usually appear is between the third month and the close of the second year. If an infant under eight weeks develops convulsions, spasmophilia may absolutely be ruled out. A spasmophilia or eclampsia occurring in children after the third year of life has been described by Thiemich as tetany, a form also known in adults.

(6) *Hereditary and Familial Predisposition*.

It may be emphatically stated that teething and worms play absolutely no part in the development of convulsions.

Symptoms and Course.—The symptom complex of the spasmophilic diathesis is not complete in every infant affected. It is rather the rule that one or more symptoms are missing. The presence of but a single

one is sufficient to characterize the infant definitely as spasmophilic.

(1) *Eclampsia*.—A condition often designated teething convulsions by the laity. By the term eclampsia is meant a series of convulsions, accompanied by loss of consciousness and beginning in tonic convulsions of the muscles of the face and, later, of the muscles of the extremities. These end finally in clonic paroxysms and cease within a few minutes. Sometimes but a single paroxysm occurs; at other times it recurs with increasing frequency, and finally a status eclampticus develops. There is very little difference between this type of convulsions and an epileptic attack, excepting that in the former the profound sleep does not follow that is so commonly seen in epilepsy.

(2) *Spasmus Glottidis*.—Laryngo-spasm which manifests itself in attacks occurring when the child seems perfectly well, or in connection with such psychic disturbances as crying, screaming, or fear. It is accompanied by a peculiar, partly obstructed, long-drawn-out, crowing inspiration, which, repeated, leads to symptoms of asphyxia and deep cyanosis of the face. Often these spasms are merged into eclamptic attacks which frequently recur.

(3) *Tetany*.—A third form of convulsions is known by the name of tetany, and manifests itself in clonic contractions of the hands and feet (arthrogryposis, carpo-pedal spasm) (Fig. 16). The hands assume a peculiar attitude known as the obstetrical position. The feet, less often involved than the hands, show an abduction of the toes. The latter are turned at the same time toward the plantar surface, and cause the foot to form a hollow arch. If these conditions persist for a long time, edema of the dorsal surfaces of

both hands and feet will develop. The clonic contractions remain sometimes for hours, and even days, and are evidently quite painful.

This tetany of the hands and feet has been designated as manifest tetany, while the triad of symptoms following comes under the term "latent tetany."

(4) *The Trousseau Phenomenon*.—One can produce the tetanic position at will in spasmophilic in-



FIG. 16.—MANIFEST TETANY.

The percussion hammer rests upon the point at which the facial phenomenon is best elicited.

fants by constricting the nerve trunks of the upper arm, for a few moments, in the sulcus bicipitalis, or by placing a rubber band firmly around the upper arm.

(5) *The Chvostek Facial Phenomenon*.—By striking the cheek in the fossa canina under the superior maxillary bone a lightning-like contraction of the muscles at the corners of the mouth, along the nose and up to the eyebrows, all supplied by the facial nerve, will occur.

If the hyper-irritability is marked, the facial phenomenon can be elicited by barely touching the cheek. The facial and the Trousseau phenomena are signs of an increased irritability of the nerves to mechanical stimuli.

(6) *The Erb Phenomenon*.—This most constant symptom is the electrical hyper-excitability of the nervous system.

This phenomenon was first found by Erb in the tetany of adults, but was also definitely established by pediatricists (Escherich and others) in the period of infancy and childhood. In the further investigations of Thiemich and Mann, it was developed into an exquisite diagnostic reaction for spasmophilia. It has actually become the connecting link which unites the formerly isolated symptoms of eclampsia infantum, laryngo-spasm, tetany, etc., into a definite clinical picture, the spasmophilia of to-day. The normal infant, if tested at the median nerve, will develop contractions in the following milliampère meter values: K.C.—1.41 milliampère meters; A.C.—2.24 milliampère meters; A.O.—3.63 milliampère meters; K.O.—8.22 milliampère meters.

The infant with spasmophilic hyper-excitability shows the following values: K.C.—0.10 milliampère meter; A.C.—1.15 milliampère meters; A.O.—0.95 milliampère meter; K.O.—2.23 milliampère meters (Thiemich).

These values are, of course, not hard and fast ones, but vary with the degree of hyper-excitability, according to the period of the day in which the test is made, and with relation to other but less important factors. Still they always show a definite and regular variation which is characteristic of the hyper-excitable infant.

(1) In the normal infants the K.O. is greater than 5 M.A.; in the hyper-excitable, it always is less than 5 M.A.

(2) In the normal infant the A.O. contraction is greater than the A.C. contraction. In the hyper-excitable, it is less.

In practice the physician meets the spasmophilic under varying conditions. At times the infant is brought to him on account of convulsions; again, on account of laryngo-spasm or the peculiar tetanic position of the hands, and finally, the facial phenomenon is accidentally discovered in the course of an examination. All of them exhibit the peculiarity of heightened electrical reaction, if this is carefully tested for.

Under an appropriate therapy most cases will be promptly benefited; others are very refractory. In these the convulsive attacks multiply and reach the most severe degree of status eclampticus; the laryngo-spasms usually follow one another. Convulsions of other respiratory muscles occur, and to the inspiratory laryngo-spasm is added the dangerous form of expiratory apnea. Sudden death from heart failure is at times observed in spasmophilic infants. It may occur in connection with one of these convulsions involving the respiratory musculature, and, again, it may come without observation. Its typical occurrence is right after a feeding which the infant has taken with apparent relish and in perfect health.

Complications.—As we have already suggested, spasmophilic convulsions are often initially provoked by other disturbances, and particularly by alimentary disturbances and infections. They form a very unpleasant complication of other disease conditions and add to the gravity of their prognosis.

A very common coincident is the combination of

the spasmophilic diathesis with rickets. Many authors have, therefore, assumed a close connection between the two in the matter of a possibly common origin.

Diagnosis.—Bearing in mind the frequency of spasmophilia in infancy, it is well to make a habit of examining every infant who is brought to one for the facial phenomenon. This symptom occurs only in this disease and is conclusive proof of the heightened hyper-excitability of the nervous system. While the test can be most easily demonstrated on the facial nerve, it may also be developed in other nerves, as, for instance, the perineal or the radial. To make the facial test, it is necessary that the child does not contract its facial muscles, as in crying. Laryngo-spasm occurs only in spasmophilia. The demonstration of other spasmophilic symptoms will prevent its confusion with the ordinary habit of holding the breath which some infants show. The tetany pose, on the other hand, is found also in organic cerebral disease.

The determination of the Trousseau phenomenon is not advisable in practice. The infant generally begins to cry, often develops laryngo-spasm and, in connection with it, may also develop general convulsions. The physician is then likely to be accused of having provoked them.

The simple occurrence of convulsions may have any one of many interpretations, for in infancy these may occur from all manner of causes. The demonstration of other spasmophilic symptoms again gives the clinical clue.

If, in later life, one wishes to draw any conclusion from the nature of the convulsions which have occurred in infancy, an accurate determination of the conditions described as characteristic of spasmophilia

will give the best basis. Convulsions occurring in the summer-time, and in breast-fed infants, and within the second month, are not, in all probability, spasmophilic.

The best *diagnostic point* in establishing the spasmophilic nature of the phenomenon is the demonstration of electrical hyper-excitability.

This test is made with the galvanic current. A large flat electrode is placed on the chest of the infant and the small Stintzig electrode over the median nerve of the forearm. A slight current is initially used and the minimal contraction is first determined. The characteristic response is the K.O. contraction. It is often sufficient to ascertain this alone. If this is smaller than 5 M.A., hyper-excitability is present.

Essentially the diagnosis of spasmophilia is based upon the demonstration of one or more of the phenomena mentioned. If one remains in doubt, the electrical reaction will determine the diagnosis in the most conclusive manner.

A *prognosis* should always be made with caution. In many cases the apparent phenomena will easily and fully clear up, in others they are only temporarily controlled, and in some cases not at all. A good estimate of the results of treatment is generally secured by measurement of the electrical reaction.

The *prognosis for later life* is good in so far that eclamptic convulsions, contrary to the teaching of the neurologist, never seem to lead to epilepsy. So far there are no authentic observations on this point. In other respects the prognosis is not so favorable. Only a certain percentage of such infants are ever entirely normal; others continue to show symptoms of nervousness common to childhood. They have attacks of pavor nocturnus, enuresis, or tic, are easily frightened, tend to stammer, etc.

Finally, a few show definite defects of intelligence. These are particularly evidenced by their retardation in school. Such children often cannot make the ordinary grades, and must be sent to special schools. Many do not learn to talk until the second year of life, and some not until the fourth or the fifth year. In this particular, the prognosis is not very favorable.

Pathogenesis.—The investigation of the pathogenesis of spasmophilia has followed two directions.

The one has sought for disturbances of metabolism. Gregor was the first to show that infantile convulsions might be influenced by the nature of the feeding. If the food is discontinued in an infant so affected, and it is starved for a certain period, the convulsion will disappear. If the same form of food is again given, the convulsions will almost immediately recur.

This behavior, which partook of the certainty of an experiment, influenced to a great degree the course of later investigation, starting with the postulate of the unfavorable effect of artificial food. Attempts were made to find out what particular element in the food caused the disturbance. The final result of these investigations discovered the noxious agent in the path of the calcium metabolism. This assumption, however, is far from being proved.

The second hypothesis advanced, particularly by Escherich, attached to the tetanoid symptoms of the spasmophilic infant a relation to tetany parathyroidea.

It is a well-known fact that by extirpation of the para-thyroids, sometimes unintentionally done in operations for goitre, a typical tetany may be produced, the cause of which is thought to be the loss of parathyroidal function. The possibility that in the infant there might be a similar loss of parathyroidal function, due to an anatomical or functional lesion of the

gland, which would result in spasmophilic manifestations, was then discussed. The question is far from being cleared up. The pathogenesis of spasmophilia, up to the present time, must still be considered obscure.

DIETETIC THERAPY

Treatment.—In latent spasmophilia, and in those cases in which the facial phenomenon, the electrical hyper-excitability and the Trousseau phenomenon are present, but in which no convulsive symptoms have yet appeared, the therapy should aim at their prevention. This is most certainly accomplished by putting the infant on breast-milk.

If in the course of weaning the infant from breast-milk to cow's milk, a facial phenomenon develops, one should at once return to breast-feeding. If this is not possible, one should, at least, give mixed feeding, adding cow's milk diluted with oatmeal water, to the breast-milk. The early feeding of additional food, such as cereals and vegetables, is advisable. Phosphorized cod-liver oil should also be given.

If one is obliged to feed the child solely on artificial food, its volume should be definitely limited. One should even be content without gain in weight for a short period. If the feeding is in any way improper it should be corrected, according to the rules laid down in Part I.

If laryngo-spasm occurs in mild form, it will disappear upon decidedly limiting the food supply. Give phosphorized cod-liver oil and add to the therapy a little calcium bromide. More severe forms of laryngo-spasm are to be treated similarly to eclamptic attacks.

In the event of convulsions, the bowels should be emptied by a laxative (two teaspoonfuls of castor oil) and all food should be discontinued for twenty-four hours; the infant only receiving tea sweetened with a little saccharin. Two after-courses are possible: The first one is breast-feeding, under which the symptoms of hyper-excitability gradually disappear. One should always decide in favor of this method if the convulsions occur at the beginning of the unfavorable season of the year, that is, in the fall, and if they seem to foreshadow a protracted or recurring course.

Less certain is the continuation of artificial feeding, which must be carried out with considerable care. Following the water or tea diet, oatmeal water is given for a period of two days; then for a further period of two days, a mixture of one-third whey and two-thirds oatmeal water, with some sugar. The phosphorized cod-liver oil therapy is begun. Finally, one may go on to a mixture of one-third milk and two-thirds oatmeal water with some sugar, continuing the phosphorized cod-liver oil therapy. If the convulsions recur, the carbohydrate diet is extended for a period of eight days. One may do this without any particular concern in those cases in which the infant has been previously fed with very large quantities of milk. One should not continue an exclusively carbohydrate diet beyond the eighth day.

On the other hand, in cases in which spasmophilia occurs in the course of overfeeding with carbohydrates, one would naturally not continue to give such food exclusively for a period of days. One rather adds milk ($\frac{1}{3}$) to oatmeal water ($\frac{2}{3}$) after a third day of starvation, and continues this feeding. Experience has taught us that, with such patients, the addition of a certain proportion of milk will favor

a more rapid recovery than if they be kept exclusively on a carbohydrate diet.

If the spasmophilia persists, it is necessary to continue these small quantities of food for a long period of time. Its nitrogen content can be increased by the addition of beef-jelly or similar substances. It is often well to begin the early administration of cereals and broth.

SYMPTOMATIC THERAPY

During the *eclamptic attack* it is best to give the infant an enema of chloral hydrate solution: Chloral hydrate, 5.0:100.0 Aq. dest. Of this solution, two teaspoonfuls may be warmed and injected into the rectum with a small syringe. The gluteal folds should be kept pressed together until the infant has gone to sleep. This usually occurs in three or four minutes. If the infant awakens after two or three hours, it is given some water or weak tea, to which is added one teaspoonful of the chloral hydrate solution. This is repeated during the entire day and the infant is thus kept in a continual slight chloral narcosis. For the following day, the solution of chloral may be given in the dose of one teaspoonful three times a day. The feeding therapy beginning to have its effect, the chloral becomes superfluous.

The same procedure is carried out in laryngospasm, excepting that it is even more necessary, in this event, to protect the child from psychic disturbance. If the threatened attack of expiratory apnea occurs, the parents must be instructed to draw out the infant's tongue, or to pass the finger far into the pharynx during the attack in order to excite the deglutition reflex and thus to produce respiration.

Cold water may be thrown into the face of the child, or it may be struck vigorously over the buttocks, or held directly under the faucet while the water is allowed to run over it.

If the spasmophilic manifestations are excited by fever or by some respiratory or other form of disease, the temperature must be depressed by continuous cold packs and should be kept below 38° C. (100° F.).

Of the remedies which are supposed to have an effect in depressing the hyper-excitability, phosphorized cod-liver oil takes the first place. Its use is based upon the fact that spasmophilia is very frequently combined with rickets, and that an improvement of the spasmophilic symptoms has often been effected so soon as the rachitis improves. It has been assumed that the phosphorus itself has some influence upon the nervous phenomenon. It is given in the same quantity as in rickets, one teaspoonful thrice daily. In case the food contains no milk or only a very small quantity, this may be increased to four or five teaspoonfuls a day. In this way, quite a considerable number of calories may be given to the infant.

Other remedies which may be used are calcium bromide (20 grams to 300 grams aqua destillat; teaspoonful three times daily). Other calcium salts, e.g., calcium lactate and calcium chloride, have been given, in doses of one gram three times a day.

If magnesium sulphate solution is used, 15 to 20 c.c. of an eighth per cent. solution are used subcutaneously.

In practice, it is advisable in acute spasmophilic disturbance, first to withdraw food and then to give the chloral hydrate solution; within the next few days to give along with the food the phosphorized cod-

liver oil. If in the course of a week, no apparent results are seen, calcium bromide or either of the other calcium preparations may be used. If this also fails, the magnesium sulphate therapy may be substituted. Under any therapy, there are certain cases which are refractory and will not subside until a more favorable season of the year sets in. If the convulsions occur constantly, producing the so-called status eclampticus, lumbar puncture should be tried or morphin injections should be given, increasing the dosage gradually up to two mgs.

PYLOROSPASM

(Pyloric stenosis, Hirschsprung, 1887.)

Pylorospasm gives a very striking disease picture in infancy. Preferably it affects breast-fed infants, and especially those of neuropathic tendency. It does not, however, entirely limit itself to these. It is also found among the artificially fed.

It seems to be of a more pronounced character in certain regions; at any rate, the largest number of cases has been reported from the Germanic countries and from North America. In the adult, a similar picture has been described by Maier and Landerer, under the name of stenosis pylori congenita.

Etiology.—The cause of the disease is found in a hyperplastic narrowing of the duodenum.

Formerly the conception was held that pylorospasm is a congenital organic malady in the form of a true pyloric closure. Later on a dualistic view was held. On the one hand, the structural quality of the stenosis was considered but, on the other, it was held that a purely functional or spastic stenosis could occur. In later years, the assumption that the spastic type of

the malady is the more prevalent has been constantly gaining ground.

Symptoms and Course.—Pylorospasm manifests itself from birth, or at any time during the first four weeks of life. It begins regularly with vomiting, which at first seems to be a simple regurgitation, but soon assumes a more pronounced form and continues in spite of all treatment. Very rapidly the rest of the symptom-complex reveals itself, but in the foreground in all cases remains the uncontrollable vomiting. This occurs just at the time of feeding or immediately after it; and, in some cases, hours later. Infrequently, the entire quantity of food taken is expelled in one large gush. The milk is either coagulated or unchanged, depending upon the length of time it has been in the stomach. Even from the empty stomach a clear, decidedly acid fluid is vomited. Study of the gastric function shows that there is a marked decrease in the motility combined with hypersecretion.

Combined with the vomiting there is a visible peristalsis of the stomach which is of great significance in the diagnosis of pylorospasm. Soon after feeding, the disturbances in the epigastric region usually begin. Continual waves of contraction are observed, beginning under the left rib margin and taking a course over the right epigastrium. The thinner the abdominal wall, the more pronounced is the movement of the stomach wall. At times it appears like a huge lump. The marked contractions cause the infant considerable pain. So soon as this peristalsis begins, it becomes very restless, draws up its legs and begins to cry; its discomfort varying with the degree of stenosis.

A more or less pronounced inanition develops with corresponding atrophy. The abdominal walls

remain rigid and are retracted, as in the cases of atrophy; excepting in the epigastrium, which is very markedly distended. The bowel movements are sluggish for want of feces-forming material (pseudo-constipation). The quantity of urine is distinctly diminished. The food is taken with difficulty on account of a certain fault the infant shows in nursing. One has the impression that the infant is continually hungry. It incessantly sucks its fingers and ravenously

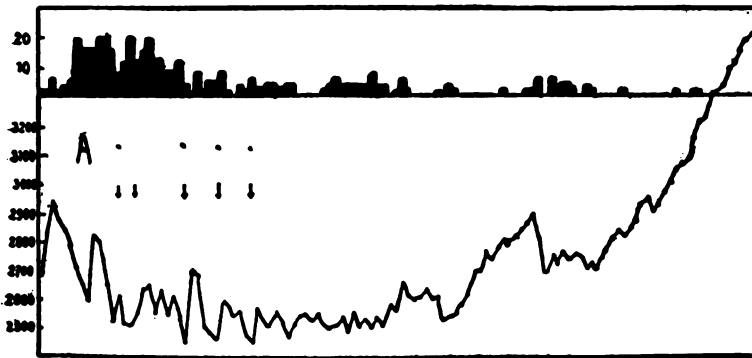


FIG. 17.—PYLOROSPASM.

Infant, four weeks old. Admitted with diagnosis of acute alimentary disturbance. Severe vomiting, but no diarrhea. For the first few days was treated for alimentary disturbance. The continued constipation and explosive type of vomiting aroused the suspicion that pylorospasm was present. This was confirmed. On breast-milk feeding the violent vomiting continued. The weight fall was rapid, and could only in a slight measure be compensated for by normal salt infusion. Recovery followed upon the administration of concentrated food (full cow's milk and mondamine). The squares in the upper part of the chart indicate the attacks of vomiting. Infusion of normal salt solution.

grasps the bottle or the nipple; but it speedily lets go, after a few nursing movements, as though it had been seized with disgust for the food.

A rare finding is the displacement of the stomach or a palpable **pyloric tumor**.

The *course* of pylorospasm is very tedious. From the beginning of the vomiting until a returning gain

in weight, some six or eight weeks will elapse. During this long period, the infant atrophies to an extreme. It approaches more and more to the danger-point of Quest's figure, a loss of one-third of the body weight, and seems to reach the limit of possible viability. With added complications, the outlook may become still more gloomy, until all hope of recovery finally vanishes. Generally at this most extreme point, the quantity of food taken increases; in short, recovery is well under way. The larger majority of cases live and, if no relapse occurs through careless dosage of food, the condition will improve from day to day.

The visible peristalsis of the stomach is the last symptom to disappear. It may be that an apparent improvement, beginning with the cessation of vomiting, is deceptive, and may prove only the prelude to the final end. Whenever infants with a pylorospasm die, the vomiting generally ceases before death, but, in these cases, the other symptoms do not improve. The weight continues to fall; the temperature begins to rise considerably; the picture of alimentary intoxication develops and under these conditions the infant succumbs.

At *autopsy* a spastic contraction of the pylorus is found, with hypertrophy of the muscles of both the duodenum and the pyloric end of the stomach.

Complications.—Complications which may become dangerous to the infant affected with pylorospasm are diseases of the respiratory tract, ulcers due to decubitus and furunculosis. In some cases duodenal ulcers have been found.

The *prognosis* is more favorable than one would expect from a disease so severe in its manifestations and course. The mortality of breast-fed infants is

low, only 5 to 10 per cent. In the artificially fed, it is somewhat higher. The prognosis for later life is also good. No case is known in which in after years the spasm of the pylorus has recurred.

Diagnosis mainly depends upon demonstration of the visible gastric peristalsis. If it is not made, or at least seldom made, the cause lies in the failure of many physicians to undress the infant during examination. Whoever makes it a rule to examine the epigastric region in every infant vomiting, cannot miss the peristaltic wave; and even if it is not observed at the first examination, the want of result in the treatment of the vomiting must lead one to the suspicion that a pylorospasm is present. This should lead to repeated examination and continued search for this symptom.

Treatment.—If the breast-fed infant is affected with pylorospasm it should be kept at the breast and should be nursed in the usually long intervals of four hours. The individual period of nursing should be shortened, however, to such an extent that the vomiting no longer occurs. In detail the treatment is as follows:

The stomach is first emptied by a thorough lavage and no food is given for four hours. Then the infant is put to the breast and allowed to nurse by the watch, and, in the first instance, only two minutes. If no vomiting occurs after such a nursing, the next period may be increased to three minutes, and eventually to four minutes, etc. In this manner one can determine, within a few grams, just where the limit of tolerance lies. So soon as vomiting occurs, the quantity of food given must be again somewhat restricted and one continues then at this reduced quantity. If the daily weighings show that the quantity

given is sufficient to prevent further weight-losses, it is well to take an expectant attitude and to treat the case as symptoms arise.

The treatment of any symptoms which may appear should never be neglected in the private home. It is well to place over the gastric region, just before each feeding, a warm compress or poultice of flax-seed or bran, which has some effect in lessening the spasm and also the pain. The infant should receive daily a high enema of normal salt solution. In this way it will receive a certain amount of fluid by rectum. A little water or mineral water, say two or three teaspoonfuls, may be given before each feeding. The following remedies have proved of value:

Tinct. thebaica 1.0

Tinct. valerian 10.0

Five drops five times a day, before each feeding.

Cocain. muriat. 0.01

Atropin. sulphat. 0.001

Aquæ destill. 200.0

One teaspoonful before each feeding.

Extr. belladonnæ 0.02 : 100.0

One teaspoonful every three hours.

Novocain 0.05 : 100.0

One teaspoonful every three hours.

If, however, the quantity of food given by mouth is insufficient and the weight-loss continues, one should attempt the exchange of two feedings of breast-milk for two of buttermilk. Exclusive feeding with buttermilk will almost always fail in pyloric cases. It will usually cause more pronounced vomiting; but in the form of *allaitement mixte* and given with breast-milk,

it is a very good combination and is very serviceable. It will cause an arrest of the weight-loss without increasing the vomiting. If this procedure, however, shows no result after a few days, it is best to return to exclusive breast-milk feeding, but to add to the quantity given by mouth some enemas of breast-milk. These are apparently retained well and are usually and entirely absorbed.

In many cases, a marked degree of *hyperesthesia* of the gastric mucosa seems to exist. Even the smallest quantity of breast-milk is rejected with explosive vomiting. Some infants show some peculiarity in that they will vomit the first portion of the food given entirely, but will retain a second portion, sometimes even a larger quantity, and given immediately after the vomiting. This expedient is so successful that it is advisable, in all cases, at least to attempt it a few times.

Heubner recommends that, regardless of the vomiting, the infant be put to the breast in the usual manner, at four-hour periods, and be allowed to nurse *ad libitum*. Some of the food taken will always be retained and will at least be sufficient to save the infant from starvation.

In other cases, again, it is better to proceed after the method of Ibrahim and to give frequent small feedings in place of the larger feeding given at longer intervals. The breast-milk is then expressed and given hourly in the quantity of ten grams. It may be given cold.

Much more difficult is the treatment of the artificially-fed infant, for often its vomiting is not interpreted correctly at an early date. It is first treated, for a long time, by discontinuance of food, or by experimenting with improper mixtures. Its condi-

tion is generally not nearly so good when it does come under treatment.

Theoretical deductions have led to the recommendation of a fat-free food. It is a fact that fat stagnates and remains for a long period in the stomach, but in practice the usual fat-free mixtures, such as buttermilk and malt-soup, generally fail and not infrequently they make the vomiting worse.

Our own experience is that it is best to give the food in very concentrated form and in small quantities. We use full cow's milk, thickened with flour and boiled for a few moments. This will give a rather thick gelatinous mixture. To every 100 grams of this food, one teaspoonful of dextro-maltose is added. This mixture is given with a teaspoon, and the infant is fed from one to two teaspoonfuls every fifteen minutes. Even a young infant will very quickly become accustomed to this form of feeding and in this way will take a considerable quantity of food in the course of a day. Part of it is vomited, but nevertheless a sufficient part remains in the stomach to sustain life, particularly if enough fluid is given in other ways. So soon as the vomiting lessens, the feeding interval may be increased and an effort made to go back to the four-hour period as early as possible.

It is extremely important to keep the atrophic infant with pylorospasm warm. In the clinic all of them are put into the incubator. Through daily enemata as well as by hypodermoclysis of normal salt solution much fluid is given. In the latter procedure, about 200 c.c. of warm water is injected subcutaneously under the loose folds of skin on the back or in the pectoral region. The body weight very promptly rises, but by the third or fourth day the water is again excreted and the weight falls to its

original figure. Another transfusion should then be given.

The rise in temperature after transfusion is without significance. In place of the injections, enemata may be given by the drop method, but these are not so certain in their effect.

It is very well to give a thorough gastric lavage, every three or four days, in order to empty the stomach of all stagnant food materials. The stomach should first be washed with warm water and then several times with cool water. Experience has shown that this has a very favorable influence upon the hyperesthesia of the gastric mucosa. Daily lavage is not so beneficial, but it may be attempted.

Along with these measures, the other therapeutic measures mentioned before are employed, such as poultices or compresses and various remedies.

The final resort in pylorospasm is to operate. A number of operative methods have been devised. A very excellent operation has been advocated by Ramstedt. The muscles of the pylorus are incised down to the submucous layer, but the latter must not be divided.

If operation is undertaken, it should be done early, at least when the infant has approached within two or three hundred grams of Quest's figure, the loss of one-third of the body weight.

HABITUAL VOMITING IN INFANCY

Habitual vomiting occurs in infants in various ways, beginning with a simple regurgitation or spitting. It steadily develops to the more severe degrees, until uncontrollable vomiting and finally pylorospasm are reached.

The cause lies, in part, in purely extraneous factors; partly in the quantity and quality of the food; and partly also in the constitutional predisposition of the infant. Such a child is of neuropathic constitution.

Of extraneous factors, improper technique in feeding is, above all, the most frequent cause of vomiting. The bottle is not given correctly; the hole in the nipple may be too large, or the infant is picked up and walked with or rocked a good deal after feeding. In all other cases, the cause of the vomiting lies, more or less, in the infant itself.

I. It commonly accompanies diarrhea in acute alimentary disturbances. It is not necessary to speak of these cases here.

II. It is also found in both breast-fed and artificially-fed infants who have been overfed. The entire habitus of these infants indicates that the quantitative factor has produced the vomiting (see page 105).

III. In other cases, the quality of the food, particularly as to its fat content, is causative of the vomiting. The infant is correctly fed as to technique, but nevertheless regurgitates constantly after feeding. The vomiting, however, never reaches such a degree that the development of the infant is particularly affected. As it grows older and is weaned to cow's milk, which contains less fat, the vomiting generally ceases. The rôle that fat plays is even more prominently emphasized in the artificially-fed infant. If it gets milk to which cream is added, or if, perhaps, cod-liver oil is given, violent vomiting occurs. If the milk is skimmed or discontinued entirely and buttermilk substituted, the vomiting ceases. If in such cases of vomiting, one is dealing with the breast-fed infant, it is sufficient, at first, to check up the

weight regularly. So long as its weight increases one may adopt an expectant policy. The same course is recommended in the artificially-fed.

If the vomiting becomes, at times, too violent, alkaline waters may be given before each feeding, or warm compresses may be placed over the epigastrium and the milk may be partly skimmed.

In all these cases, the vomiting plays merely the rôle of an unpleasant symptom. It makes for soiled clothes and may cause eczema about the neck, the occiput, or the ears, or on any other part of the body where the vomitus happens to lodge. While it never becomes grave in these cases, there is a type of disorder in which it assumes a serious aspect.

IV. There are infants who regurgitate from the day of birth. At first vomiting occurs only periodically and in moderate degree, but eventually it is of regular occurrence and of so intense a character that the larger part of the food is rejected and there is a decided loss of weight. They emaciate rapidly and remain atrophic in spite of every form of therapy. On this account, the suspicion arises whether the case is not one of obscure pylorospasm—a suspicion which cannot, however, be confirmed. Usually it proves to be a severe type of *nervous vomiting*.

Infants of neurotic quality are easily recognized. Their entire makeup is that of the neuropath. They are easily frightened, are restless, sleep very lightly, show marked dermatography and a musculature which is constantly hypertonic. The abdominal walls are very rigid, so that the contour of the recti muscles is very prominently outlined. Eventually, the stomach takes part in this nervous irritability and even normal amounts of food act as an emetic.

The *treatment* of these infants is a very ungrate-

ful task. Every form of therapy seems to fail. Under artificial feeding the malady may extend even into the second year of life. A large number of children succumb to the progressively increasing vomiting. But in the breast-fed infant it is well to avoid a radical therapy. One may confine one's self to few remedies and to the warm compresses, and assure the parents that so soon as the infant is old enough to take semi-solid food an improvement of the condition is likely to occur. This expectant treatment is the easier in families in which other infants have had the same tendency to regurgitation. The parents have come to look upon the symptoms merely as one not to be avoided.

Under artificial feeding, one may also attempt to carry the child along without gain in weight, until the period of life comes when they can take solid food. Some remedies are efficacious. If on certain days the vomiting becomes excessive, one may discontinue milk for twenty-four hours and give only weak tea or water. Sometimes the vomiting improves if a small dose of chloral hydrate is given just before the feeding. So soon as the infant begins to get drowsy, the bottle is given. It quickly empties it and goes to sleep without having vomited.

True to its etiology, the neurotic type of vomiting proves not only an obdurate but a recurring malady. Not infrequently one observes this disorder in school-children. Their history will almost always show that they regurgitated a great deal as infants.

V. Finally, another group of regurgitating infants is observed. They have this in common with the neurotic type, that they are retarded in growth and of stationary weight. They do not, however, exhibit the hypertonic state which characterizes the former

group. On the contrary, they are definitely atonic. They are atrophied, pale infants with very scanty adipose tissue and deficient muscular and skin tonus. When they are placed in the erect posture, they collapse. Their vomiting is in the nature of a spasmodic eruption of the stomach content. A part of this is again swallowed and part of it flows from the corners of the mouth. Many of these, persistently overfed, have formed the habit of moderate regurgitation. Through persistence in the error, the vomiting has developed into an uncontrollable form, under which they eventually fail.

By treating such a case with breast-milk given in very small quantities and only sufficient to prevent marked loss of weight, an improvement in the vomiting will occur within a few weeks. Finally it will cease entirely and the infant begins to gain. If one is obliged to feed artificially, the administration of semi-solid food is, in the end, most successful. (See Pylorospasm.)

ALIMENTARY DISTURBANCES DUE TO CONGENITAL DEFECT IN THE STRUCTURE OF THE ORGANISM

HIRSCHSPRUNG'S DISEASE

(MEGACOLON)

Dilatation of the colon, congenital or developing in early infancy, is designated as Hirschsprung's disease. It is an infrequent condition.

Etiology.—The causes of the dilatation of the intestine are as follows:

1. Circumscribed spasm or paralysis of the lower colon.

2. Mechanical obstruction of the intestinal lumen, as, for example, by volvulus, diverticula of the intestinal wall, etc.

3. In very rare instances, a primary dilatation of the colon occurring as a congenital anomaly, analogues of which are found in other parts of the alimentary tract, as in congenital dilatation of the esophagus, etc.

The disposition to such obstruction is incident to the fact that the sigmoid flexure is much longer and much more movable in the infant than in the adult and, therefore, more readily subject to changes in position. Normally, a lessening of the lumen of the lower bowel is found at certain points, as where the descending colon merges into the flexure and where the flexure merges into the rectum. At these points, and particularly in the latter, the kinking preferably occurs and the result is a coprostasis, leading to the portion of the bowel immediately above the stenosis, together with a compensatory hypertrophy.

This results in the following clinical symptoms:

1. Pronounced constipation.
2. Enlargement of the abdomen, caused by stasis and accumulation of gas. It may sometimes assume immense proportions.
3. A visible peristalsis. This phenomenon is manifested periodically; it either occurs spontaneously or may be provoked by touching the abdominal wall. It appears as a huge intestinal coil, and extends from the epigastrium to the pelvis.

These manifestations may be present from birth. The infant is born with a relatively large abdomen. The meconium is voided very late. By and by, the cardinal results recited develop, with other concomitant symptoms. The distention of the abdomen pushes the diaphragm upward and causes dyspnea.

There is pronounced inanition and pallor. The subjective condition of the infant is bad. In advanced stages, edema of the dorsal surfaces of both hands and feet appears. In some cases, symptoms resembling ileus occur, accompanied by vomiting and collapse. There is generally very pronounced constipation, although sometimes a spontaneous bowel movement passes. There are cases in which the stools pass daily, and in some there is even a periodical diarrhea. In the end stages of Hirschsprung's disease, diarrhea is not infrequent.

The course of Hirschsprung's disease is exceedingly chronic. Many of the children attain to a considerable age. A second group improve so much that they seem to be cured. A third group succumb. They die of exhaustion, of intercurrent disease, of intestinal ulcer, perforation of the intestinal wall and subsequent peritonitis.

The *diagnosis* is based upon the three principal symptoms of Hirschsprung's disease. In the breast-fed infant one may exclude habitual constipation, so commonly found, with the artificially-fed infant in alimentary disturbances due to the overfeeding of cow's milk. The protruding abdomen (frog's belly) of the rachitic infant is rarely confused with the characteristic condition in Hirschsprung's disease. Some difficulty is found in differentiating tuberculous peritonitis and certain tumor formations (congenital cysts, tumor of the mesentery) from this malady. In contradistinction from tuberculous peritonitis, the tumor in Hirschsprung's disease has a characteristic feel, or doughy sensation. Tuberculous peritonitis gives a positive Pirquet reaction; it frequently shows a conglomeration of small tumors and usually a marked peritoneal effusion.

In all cases a rectal examination should be made to differentiate the picture and to determine the diagnosis. The bowel should be explored with a large, soft, intestinal bougie. In some of the cases observed, an obstruction was discovered six or seven cm. above the sphincter. At a variable point, it will always be found.

The sound may frequently be passed readily beyond this, and again, at times, this is done with great difficulty. The moment the bougie passes the obstruction, large quantities of gas will be expelled and the circumference of the abdomen shrinks markedly. By injecting air, the intestine may again be filled to such a degree that the contour of the dilated colon is easily visible through the abdominal wall. The seat of the stenosis can be determined by the aid of the Röntgen ray. To do this, the colon is first emptied, as completely as possible by the bougie; the infant is then given a bismuth paste and the Röntgen exposure made on the following day. In this way, the progress of the bismuth paste may be followed up to the point of the constriction.

Therapy.—Remedies are almost useless in the treatment of Hirschsprung's disease. Where a spastic contraction of the intestine is suspected, such remedies as belladonna or opium may be tried.

If the stenosis is so high up that it cannot be reached by the finger, the question of gas dilatation must be considered. If the intestine is kinked, it is well to introduce the sound or the bougie daily with the infant lying on the abdomen. This permits the removal of gas, when the fecal débris can be washed out, after two or three days, with water and soap-suds.

There are those who believe that by filling the dilated colon with water, it is possible to straighten

out the intestine, when the passage becomes free for a short period. If the seat of the stenosis is very low, one can sometimes succeed in releasing the kinked portion with the finger. It is possible to maintain permanent drainage by way of a sound or bougie for a number of months.

In all cases, the result of the treatment by these methods is very unsatisfactory. One must always consider the advisability of operation while the general constitutional condition of the infant remains good. In our judgment a resection of the dilated colon is the only operative procedure which should be considered. The use of purgatives is contraindicated.

PART IV

THE DISEASES OF INFANCY

CHRONIC INFECTIONS

Congenital Syphilis.

Syphilis may be acquired by the infant before, during or after birth. In the first two periods of infection, one speaks of congenital syphilis; in the last period of acquired syphilis, a form so rare that it need not be considered here.

Etiology.—The causative agent is the spirocheta pallida, discovered by Schaudinn and Hoffman. The transfer of infection from mother to infant takes place through the diseased placenta.

Symptoms and Course.—The fetus, in pre-natal infections, frequently dies in utero and is expelled post mortem. A second group are born alive, some of them prematurely, others at full term, presenting manifest syphilitic symptoms, such as splenic tumor, pemphigus, and bone lesions.

A third group, at first appears healthy, but shows syphilitic lesions in the course of the first two months. The occasion for bringing the infant to the physician may be noted.

I. *Changes on the external skin* and mucous membranes, e.g., coryza luetica. This begins as a dry snuffle and later develops into sanio-purulent, indurating coryza which greatly interferes with nursing and breathing. Through an involvement of the perichon-

drium and the periosteum the saddle nose is formed. The lips show rhagades which bleed easily and extend beyond the red margin of the lips into the adjoining skin. The tongue is marked with pea-size plaques. The eyebrows and the scalp show alopecia. Around the mouth and nose and over the forehead appear extensive diffuse skin infiltrations which cause the skin to assume a leathery feel and to take on a peculiar grayish-yellow discoloration (resembling café au lait, or the stain on the fingers of an inveterate cigarette smoker). Later these develop, also, on other portions of the body, as the palmar and plantar surfaces, the inner side of the thigh, the buttocks, beneath the chin, and on the cheeks. The skin over these affected parts is tense, flesh-colored, and smooth and shiny, as though it had been polished. Along with these lesions, circumscribed syphilides are observed. Pemphigus, usually congenital or developing early, and preferably involving the palmar and plantar surfaces; macular and papular exanthemata of pale yellow or brownish discoloration, or of less intensive coloring; and squamous or pustular forms are also seen. Paronychiæ develop upon the finger-nails. If the skin eruptions have disappeared, a pronounced pallor of the skin, due to an actual anemia, is evident.

Most of these skin changes, excepting pemphigus, develop first after birth. On the other hand, intestinal and bone lesions generally develop during the fetal period and extend into extra-uterine life.

II. *Visceral Manifestations*.—A symptom hardly ever missed is splenic tumor. Diffuse interstitial hepatitis leads to enlargement of the liver, which frequently results in icterus and ascites. The urine almost always contains pus, casts, and red blood cells.

Luetic changes occur in the heart, but cannot be determined clinically. Syphilis of the lungs is only found in children who are not viable.

III. Among the *changes in the central nervous system*, syphilitic hydrocephalus and pachymeningitis hemorrhagica should be particularly mentioned. Optic neuritis is of very frequent occurrence. It is a symptom, however, which is of no great practical value in the diagnosis of syphilis in infancy.

Histologic examination of the macroscopically intact brain in syphilitic new-born infants shows remarkable changes which, in later life, are probably not entirely without significance. Meningeal changes, extending to the brain cortex, and resembling a meningo-encephalitis, are seen. In the brain, lesions are observed about the vessels, as circumscribed encephalitic areas with diffuse involvement of the brain substance, which may be the beginnings of later pathological manifestations.

IV. *Bone Lesions*.—Diseases of the bones are found with enormous frequency, but not necessarily cause clinical manifestations. They occur either as osteochondritis luetica (Wegner), or as periostitis. The former type appears if the lower epiphyses of the humerus are involved, as preferably they are, and here it leads to fusiform swelling of the elbow-joint. As a result, the arm is held fixed and simulates a paralysis of the so-called Parrot form. In the neighborhood of joints which are especially liable to traumatic injury, as, for example, the shoulder-joint, osteochondritis may cause a loosening of the epiphyses, spontaneous fracture in the upper end of the diaphesis, and complete destruction of the entire head of the bone.

The periostitis becomes localized in the shaft of

the long bones and surrounds it with a thick callus of newly-formed bone substance. The bones on this account feel irregularly rounded and thickened. In the short bones of the fingers, phalangitis develops. Resorption processes occur in the bones of the skull and produce sharply circumscribed fontanelles. More frequently, apposition of the hypertrophied edges of the bony substance takes place, preferably involving the bones of the forehead. If a slight hydrocephalus is added to this, the abnormally high, so-called

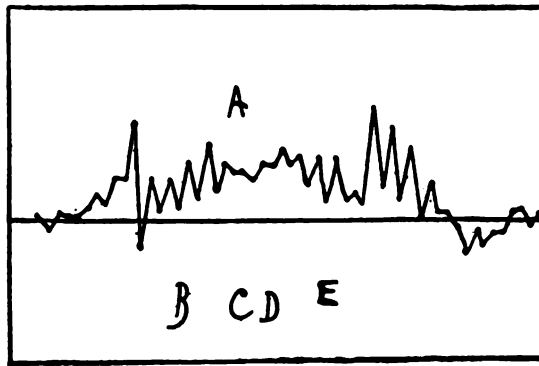


FIG. 18.—TEMPERATURE CURVE IN CONGENITAL SYPHILIS.
Suspicious eruption on plantar surfaces. Inunction. Coryza.
Exanthem on anus. Wassermann +.

“Olympic forehead” develops. The eruption of the luetic exanthems is frequently accompanied by protracted remitting fever, varying between 37° to 38° C. (99° to 100° F.) (Figure 18).

Diagnosis.—The diagnosis of congenital syphilis can hardly be mistaken if the skin manifestations are fully developed. It is more difficult if the symptoms are not very pronounced; for example, if only sniffles are present, or if merely the spleen is palpable.

Too much importance must not be attached to the family history as regards abortions, in view of

the very common practices of the present day. A typical syphilitic history in this particular, usually runs about as follows: At first, abortions occur early in the period of pregnancy; eventually babies are prematurely born, and finally, if the infection of the parents has been long present, children are carried to full term.

The question of the existence of an eruption at the time of birth or shortly afterward, is frequently answered in the negative by the parents. Cases do, in fact, occur in which the exanthem is entirely absent or is so slight that it is overlooked.

In many of these rudimentary cases, the diagnosis can be made only after long experience. One who has seen many infants with congenital syphilis may have a suspicion or impression of its presence. The Wassermann reaction generally confirms the suspicion. To differentiate luetic from non-luetic but quite similar symptoms it may be stated that luetic rhagades extend beyond the red portion of the lips and that luetic skin infiltrations occur in portions of the skin which are exempt from irritative or traumatic influences; while on the contrary intertrigenous chronic eczema often resembling condylomata is located in the genito-anal region and in an area which is under the constant influence of sweat, the feces, and urine.

A lingua geographica should not be mistaken for a luetic lesion. Dermatitis exfoliativa and erythroderma have nothing in common with syphilis. Erb's paralysis of the arms in the new-born may be differentiated from Parrot's paralysis by the time of its occurrence.

The greatest certainty of diagnosis is given by the demonstration of the spirochetæ, and the positive Wassermann reaction. To demonstrate the *spirochetæ*,

a small part of the secretion is taken from the rhagades with a platinum wire, or the superficial epithelial layers may be scraped from a papule with a scalpel sufficiently to cause oozing of lymph. This is transferred to a slide and mixed with one or two loops full of India ink, and then spread out on the slide in a thin layer with a cover slip, just like a blood specimen. It is allowed to dry in the air and examined with an oil immersion lens. The white spirochetæ will show clearly on the dark ground.

For the Wassermann reaction, 5 c.c. of blood are drawn from a vein in the arm or of the skull, or may be taken by dry cupping. The latter method is generally advisable. The skin is first cleaned with thymol alcohol (5 per cent.). A number of small incisions are made with the cupper, and by means of a vacuum cup a sufficient amount of blood is obtained.

The Röntgen examination also gives very characteristic findings. If osteochondritis is present, an intense linear shadow will show in the epiphyseal line. It runs in a smooth or slightly wavy course to the diaphesis, but toward the epiphyses it is marked by a somewhat serrated edge. Approximate to the shadow and extending toward the diaphesis of the bone, great areas in the bone substance show. Where there is separation of the epiphyses, the Röntgen picture shows that much the more frequently there is a loss of continuity at the end of the diaphesis, rather than a real epiphyseal separation.

In periostitis syphilitica, the bone will show on both sides a more or less heavy structural shadow.

The *prognosis* depends upon the severity of the infection, the time of its occurrence, the condition of the infant, and the form of infection in the parents. The more recent the disease in the parents, the more

intensive the infection in the child. Children prematurely born, or developing alimentary disturbances, who have been syphilized before birth or who develop syphilitic symptoms rapidly after birth, and who fail of proper treatment, give a very bad prognosis. This is especially true when these infants are infected with visceral lues.

In general, the treatment of syphilitic infants is a grateful task. If the treatment is not properly carried out, recurrences are common during the first year of life. The *prognosis for later life* is by no means bad. If the treatment has been thorough, these infants remain bodily and mentally well.

The *treatment* of congenital syphilis in the infant involves also the treatment of the parents. One should tell them frankly of the diagnosis of syphilis. The Wassermann reaction should be taken in both parents and they should be urged to undergo thorough treatment.

A syphilitic infant, or one suspected of the disease, should, if possible, be nursed by its own mother. The mother herself is practically always syphilitic, even if she never has manifested any symptoms. Even a negative Wassermann reaction does not preclude the possibility that she has the disease, for experience has taught us that one salvarsan injection is often sufficient to develop a positive test.

If a nursing mother be injected with salvarsan, the drug will usually reach the infant through the breast-milk. To put the syphilitic infant on the breast of a wet-nurse is not permissible.

For the treatment of the suspected infant, several remedies are available:

1. *Salvarsan*.—Neo-salvarsan, 0.15 (=0.1 salvarsan) can be injected into the gluteal region according to

the prescribed method, three or four times at intervals of a week.

2. *Mercury*.—This may be given by mouth in the form of the yellow oxide, or intramuscularly in the form of the bichloride, or cutaneously by rubbing in the blue ointment.

Before commencing treatment the urine should be examined in order to determine the presence of albumin. The presence of the latter is no contraindication to the use of salvarsan or mercury. Neo-salvarsan injections should be given in the gluteal muscles rather deeply, but not too near the bone, since necrosis may occur, a tendency which has excluded the use of salvarsan.

In very severe cases, as, for example, of visceral syphilis, the salvarsan injection may be followed by a universal exanthem which may prove fatal. In such cases it is advisable to give mercury first, for about eight days, and then to inject salvarsan. In general it is customary to give mercury along with salvarsan. The easiest way to give the former is by mouth.

If the mercury is used on the skin, a small portion of the ointment should be rubbed in daily and a bath given on Sunday. The bichloride injections are used in patients when one feels that the parents do not readily understand the severity of the disease or the necessity for intensive treatment.

Salvarsan injections are generally repeated some four times. Mercury is given for a period of about six weeks. This treatment should be repeated three or four times in the course of two years. The use of bichloride baths is without effect.

Along with internal treatment, *local* treatment should always be used. White precipitate ointment is applied to the ulcerated areas. Bleeding rhagades

should be touched with a 1 per cent. silver nitrate solution. The nose must be very carefully treated and the nasal passages kept open. For the first few days, the physician himself should treat the nares daily with a hydrogen peroxide solution (3 per cent.), and should afterward apply the precipitate ointment. Later on the mother may remove the secretion before each nursing with the aid of the peroxide of hydrogen.

If Parrot's paralysis has developed, the affected arm should be fixed up on the thorax with adhesive plaster. A control of the results of treatment by the Wassermann reaction is unfortunately impossible. Neither mercury nor salvarsan has so far succeeded in making Wassermann reactions negative. The only assurance one has of a cure is thorough and extended treatment and the nonrecurrence of the disease.

Tuberculosis.

Etiology. Tuberculosis is rare in the infant. It may be caused in various ways:

1. By transfer in the *spermatason*. This is an origin theoretically possible, but practically negligible.

2. *Placental* transmission. If the placenta of a tuberculous mother shows tubercular changes, infectious material may enter the infant organism. In this way a congenital tuberculosis may be produced. Such cases have been observed.

3. The *aërogenous* route is probably the most frequent mode of infection in the infant, transmission occurring from the tuberculous mother or attendant by kissing or coughing over the child, etc.

4. By *alimentary* transmission, in the taking of milk containing tubercle bacilli, or by swallowing

tuberculous material contained in dust or in the discharges.

Symptoms and Course.—Depending upon the locality in which the tubercle bacillus implants itself, the course varies, particularly from the standpoint of prognosis.

1. The physician meets with visceral tuberculosis in a number of forms. An infant is brought in for some minor infection. In the course of examination, an enlarged spleen and liver are found. Along with these findings a marked pallor is noted, but no other manifestations appear. The Pirquet reaction is applied and eventually the Wassermann reaction. The latter is negative; the former, however, is definitely positive. These are usually the conditions found in cases of congenital tuberculosis.

In another type, one finds an atrophic infant with a precarious history. Slight irregular temperatures have been observed. The spleen is somewhat palpable. There are individual glands, palpable and enlarged, in unusual locations, as, for example, in the floor of the mouth, in the axilla or beneath the clavicle, or at the angles of the jaw. The skin at times shows tuberculous follicles, in the form of small, brownish-red areas about the size of a mustard seed. The abdomen is rigid, distended and meteoric. If the emaciation is far advanced the Pirquet reaction will be negative. With progressive emaciation, death occurs. At autopsy an extensive tuberculosis of the bronchial and visceral glands will be found with metastases in the spleen, liver and lungs.

In still other cases, pulmonary manifestations are prominent from the beginning. They appear usually in atrophic infants who have a continual cough, often of spasmodic quality—a bronchial gland cough—and

who show continuing catarrhal symptoms in the air-passages. These cases do not assume so severe a degree that one would suspect tuberculosis, if the history did not reveal the fact that either the father or the mother is definitely tuberculous. With progressively increasing dyspnea, aggravated at times by an inter-current catarrhal pneumonia, a fatal termination ensues. A Röntgen examination made of children in more advanced stages of tuberculosis shows astonishing findings. Circumscribed shadows in the region of the hilus indicate enlargement of the bronchial glands. Minute dotting of the entire lung shadow shows a definite miliary tuberculosis, while more indefinite areas, of the size of a hazel-nut, may be suspected as cavities. These findings are eventually confirmed by autopsy. It is difficult to get good Röntgen pictures on account of the severe dyspnea in these infants.

Finally, there are infants who fall ill with acute meningeal symptoms, uncontrollable vomiting, convulsions, or slight clouding of the sensorium. These succumb in a typical manner, showing hyperpyrexia and irregularity of the pulse at the close.

Diagnosis.—The family history usually arouses a suspicion of tuberculosis in the infant, in the mere fact that it is born of parents affected with tuberculosis. The suspicion may be confirmed by a positive Pirquet reaction. If it is negative, general conditions in the infant may be at fault. Splenic and hepatic tumors and glandular enlargement further strengthen the suspicion. Especially valuable findings, but only in clinically advanced cases, are made by the Röntgen ray.

The *prognosis* is grave.

Treatment is of very little benefit. In order to do something, one may prescribe cod-liver oil with

creosote, in half-teaspoonful doses, twice a day. If there is much cough, a codein preparation may be given morning and evening.

II. *External tuberculosis* exhibits itself in the infant in the forms of spina ventosa, disease of the cranial bones, diseases of the joints, cold abscesses, tuberculous skin follicles, etc.

The *prognosis* in many of these external forms is good. It is doubtful only in tuberculosis of the ear and of the cranial bones, on account of the liability to the extension of the disease to the meninges. The treatment in all these cases is extremely conservative. One should apply dressings, and in general follow an expectant course. The care of tuberculosis of the ear should be in the hands of a specialist. Tuberculin is practically without value.

III. A third group of infants give evidence of tuberculous infection by a positive *Pirquet reaction*. They show, however, no manifestations of tuberculosis whatsoever, either in infancy or in later life. They are apparently well. The infection remains, as it were, latent in some gland or other portion of the organism. It was formerly believed that if an infant showed a positive Pirquet reaction, one always had to deal with a progressive and an eventually lethal tuberculosis. This conception is not correct. One must differentiate in the infant, as one does in the adult, between tuberculous infection and tuberculous disease. For this reason, a positive Pirquet reaction in the infant is not necessarily an indication for treatment. Such an one should always be kept under careful supervision and should be protected with the greatest possible pains, against infections, especially of such types as measles or pertussis, which experi-

ence has taught us may very quickly enkindle a latent tuberculosis.

PECULIARITIES IN THE COURSE OF ACUTE INFECTIOUS DISEASES IN THE INFANT

Measles.

Infants are almost immune to measles during the first year of life, but later are infected as readily as older children. The course of measles is frequently abortive. A fever without any particular characteristics and of very slight degree, frequently occurs. This is accompanied by catarrhal symptoms in the respiratory tract, as coryza, cough, etc. A slight eruption appears, which generally fades away in a few days. These cases are only correctly diagnosed as measles when they occur in the courses of an epidemic. They are dangerous in that they may carry infection into an infant's hospital. Atrophic infants, especially, show this form of measles.

Typical measles does not, generally speaking, run a severe course in infants, but an attack may become serious on account of its complications, e.g., bronchopneumonia, otitis media, parenteral alimentary disturbances, and severe eczema. On account of these complications, measles often become a grave affection, and infants, therefore, should be protected as much as possible against the disease. There is no greater mistake than the custom, in former practice, of putting all the children of an infected family together, so that they may all develop measles at the same time.

Diphtheria.

Diphtheria occurs less frequently in infancy than in later life. Nevertheless, it is not infrequently ob-

served. Ulceration of the vulva in female infants, believed to be due to trauma or lack of cleanliness, and slow to heal, are sometimes due to diphtheria. Coryza in infants resisting treatment should always arouse suspicion of this disease. Nasal diphtheria often occurs endemically in infant hospitals. Laryngeal diphtheria is manifested by a croupous cough. It is more common than faucial diphtheria. Often the latter does not cause pronounced symptoms in the infant and is frequently overlooked.

In all cases, in addition to local treatment, anti-toxin should be given intramuscularly in the gluteal region. If the general condition is good, 600 units may be used in vulvar and nasal diphtheria, and 1,000 units in laryngeal or faucial diphtheria; but with marked constitutional disturbance the dose should be increased to 3,000 units.

Varicella (Chicken-pox, Water-pox).

Varicella runs as harmless a course in infants as it does in older children. At times, it leaves an unpleasant after-effect in the form of protracted eczemas. In cachectic infants and particularly in those overfed with carbohydrates, a varicella infection may take on peculiar characteristics resembling variola, in that the eruption becomes hemorrhagic and leaves deep ulcers with indurated bases.

Pertussis.

Pertussis shares with measles its frequency among infectious diseases affecting the infant. There are physicians, however, who deny the possibility of the occurrence of pertussis in infancy. The clinical picture of the disease in the infant really differs considerably from that in older children.

Peculiar attacks of coughing are the characteristic

feature of pertussis. In a child who appears perfectly well, a severe coughing attack occurs which, abating and giving the child a moment's rest, recurs with the same severity. This second attack, the so-called reprise, marks the cough as a symptom of pertussis. This peculiar type of cough is absent in the pertussis of the infant, but the disease, in somewhat different form, occurs at a very early age. Cases are reported as early as the fourteenth day. Alarming symptoms accompany the disease, such as bleeding from the nose, hemorrhage in the conjunctivæ, ulcers of the frenum of the tongue if the child has teeth. The severe cough favors the protrusion of umbilical and inguinal herniæ. Among its complications are para-enteral alimentary disturbances, bronchial pneumonia and purulent meningitis. Infants who have spasmophilic tendencies, may develop eclamptic convulsions and laryngo-spasm with severe asphyxia.

Treatment is fully as unsatisfactory as it is in older children. If the attack is somewhat mild, one allows the infant to cough during the day; and takes it out into the open air if there are no pronounced complications. If this is not possible, it is taken frequently from room to room, and each room, as vacated, is thoroughly aired. A warm bath is given morning and evening and at night; a tepid compress may be applied around the chest and a little codein may be given early in the evening and, again, later in the night. It should always be given after an attack.

If the attacks recur so frequently during the day that the infant is completely exhausted and refuses food, it may be necessary to give narcotics during the day also. These are traditionally combined with

quinin which seems, however, to have very little effect.

Pertussis is a disease of long duration; usually all the children of a family are affected. For this reason medical treatment is very expensive, and one should have regard for this in practice and should not use costly quinin preparations, since the narcotics alone are fully as effective.

In the event of convulsions, lumbar puncture is recommended. It seldom does much good. It is better to keep the infant drowsy for a portion of the day by the use of repeated enemata of chloral hydrate. If the convulsions are purely spasmophilic in nature, an exclusive carbohydrate diet, for several days, is valuable. In every case complicated with convulsions, the prognosis is grave and the treatment difficult.

Rare Forms of Infectious Disease.

Rubella does not occur, excepting in older children.

Scarlet fever has been observed in rare cases; developing especially in the breast-fed infant, whose mother is ill with the disease. The sixth month of life is the liability threshold line, below which scarlet fever hardly ever occurs.

Typhoid Fever.—An infant may be born with typhoid fever. Always, in such a case, the mother is ill with the disease. Even though the infant appears well, nevertheless, the Widal reaction will be positive.

It is a question whether *parotiditis* and acute articular rheumatism ever occur in infants.

Malaria may be congenital or acquired, but it does not always occur, even in regions where malaria is

prevalent, or the mother has or has had the disease. Infected infants react very promptly to quinine.

Erysipelas.—This disease is found in the new-born and usually originates in the umbilical wound or follows other traumata of birth. In older infants, it is generally a sequel of varicella pustules which have been scratched. It is accompanied by high fever, but the prognosis is generally good. Upon the extremities its progress may be arrested by surrounding it with adhesive plaster or by painting the margin with collodion. The application of moist compresses of aluminum acetate is generally all that is necessary by way of treatment.

Cerebro-spinal meningitis also occurs in infancy. A positive diagnosis can be made only by lumbar puncture and the demonstration of meningococci in the spinal fluid. In some cases the course of the disease is fulminant and leads, in three or four days, to death. In others, the course is very prolonged and occasionally one observes abortive forms which show slight meningeal involvement, and result in recovery. Serious disturbances of intelligence and of hearing generally remain.

A reported characteristic symptom of *trismus* in the infant is the absence of the Kernig symptom.

VACCINATION

According to the German vaccination law of 1874, every infant must be vaccinated before it has completed the first year of life. Earlier vaccination than this is recommended only when the danger of smallpox is imminent.

It is well to delay vaccination until after the second year of life in infants who are very ill, who

have pronounced alimentary disturbances or severe manifestations of exudative diathesis. In children with chronic eczema it is better to wait even until the third year of life. The best time to vaccinate is in the spring and fall.

Technique.—Before vaccination it is well to have the infant completely undressed, at least as to the upper part of the body, and to submit it to a very close inspection. If it shows exudative conditions, vaccination should not be undertaken. Otherwise, the outer surface of the upper arm or thigh may be cleaned with benzine or thymol alcohol (5 per cent.). A slight scarification is then made of the surface to draw blood, but it is enough to cause oozing of serum. A small quantity of vaccine lymph is applied over this area, rubbed in somewhat with a scarifier and allowed to dry. The infant should be on the lap of the mother and she should hold the baby's hands until the lymph has dried. The area is then covered with a sterile piece of gauze, and this again with a perforated strip of adhesive plaster or with a bandage. This should remain on the part until it is reexamined.

Eight days later the infant should be returned for examination. The vaccination may be considered positive or as having "taken," if one pustule has appeared. If no pustule has appeared, the fault lies generally with the vaccine, and the vaccination should be repeated with fresh material.

The course of development of the vaccine and the vaccinea pustule, begins within two or three days with a small papule, which appears slightly indented in the center. The papule grows larger, until about the ninth day, when it appears white and then becomes more and more yellow. After the ninth day,

it has reached its maximum development and begins to dry. After three or four weeks, it remains as a dry crust, which falls off about that time and leaves the vaccination scar.

At the height of its development, the pustule is surrounded by an intense areola, sometimes as large as the palm of the hand. The axillary glands are often painfully swollen, and pronounced constitutional symptoms develop; the appetite is poor; there is some constipation or, at times, diarrhea. Generally

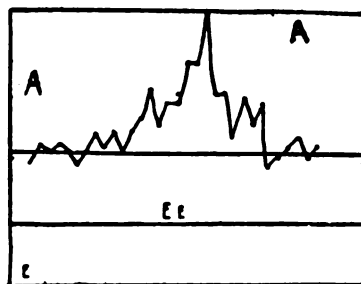


FIG. 19.—VACCINATION.

A, vaccination temperature. E, vomiting.

scarlatinal exanthema appears over the entire body. After two or three days, these symptoms subside.

By scratching the vaccination wound, a generalized vaccinia may be produced. To guard against this it is well to apply moist dressings to the vaccination wound. One should always avoid vaccinating infants with itching eczemas. Through the scratching of the pustules, infections, also, may be produced and cause suppuration. This may eventually lead to some focus of suppuration, as of the axillary gland, to erysipelas, impetigo, etc. For this reason, a bandage should always be applied over the vaccination wound at the second visit.

If there is spontaneous reaction with reddening

and swelling of the shoulder region, dry, pure boric acetate ointment, or wet compresses of aluminum acetate, may be applied. Such a pronounced reaction is often observed in the overfed infants. It is well in such an individual to make the vaccination very superficial and to apply the lymph over only a small area.

In order to avoid unsightly vaccination scars in young girls, it is customary to vaccinate them on the thigh or just below the mammilla. In these cases, extraordinary precautions must be taken to prevent scratching. Harmful effects of vaccination, as the transmission of syphilis, a result attributed to it by the anti-vaccinationists, are impossible.

The period of protection conferred by vaccination against infection by smallpox, is generally estimated at about five years.

DISEASES OF THE UROGENITAL ORGANS

Diseases of the urinary tract in children are rarely substantiated because of the difficulty of obtaining the urine in very young children, but they are by no means infrequent.

Physiological albuminuria is found in the newborn. Secretion of albumin with casts, and also of red-blood cells, occurs in the course of sepsis neonatorum, of alimentary intoxication, of congenital lues, of impetiginous eczema, and in severe disturbances of carbohydrate metabolism. Bloody urine is one of the first signs of Barlow's disease.

Severe hemorrhagic nephritis is observed after the use of certain medicinal remedies, as, for example, beta-naphthol.

Edemas, in general, do not belong to these various

forms of renal affection. They may occur congenitally, as in congenital dropsy, or they are alimentary in origin and are brought about by a high salt-content of the food, or are found in cases fed on whey, skim milk, bouillon, salted oatmeal, gruel, Heim-Johns mixture, etc. They appear most frequently on the dorsal surfaces of hands and feet.

Spasmophilic infants with the tetany pose of hands and feet will often show edemas of their dorsal surfaces.

Pyelitis.

The most important disease in the urogenital tract in infants is the so-called pyelitis (pyelo-cystitis, pyelo-nephritis, formerly also termed the coli-cystitis of Escherich). It occurs as frequently in breast-fed infants as in the artificially fed. Preferentially, it attacks girls, only 10 per cent. of the cases occurring in boys.

Among older children and adults it also favors the female sex.

Etiology.—In rare cases, it arises from bacterial infection with the colon bacillus (Escherich). Other bacterial forms, such as the protein or alkali-forming bacteria (Krasnogorski), etc., may be present. Regarding the mode of infection, various theories are held. The prevalence of the condition in the female sex leads to the conclusion that the peculiar structure of the urinary tract, notably the shortness of the female urethra, favors an ascending infection. On the other hand, there is sufficient ground to assume the possibility of a transmission of colon bacilli from the intestine through the blood and lymph circulation; and all the more so, since lymph relations between the region of the appendix and the right kidney exist.

The seat of infection cannot always be determined with certainty. It may attack the kidney itself, the pelvis of the kidney, the urethra and the bladder. In the majority of cases, it occurs in the pelvis of the kidney.

Symptoms and Course.—Acute pyelitis is accompanied by high fever and severe prostration of the infant. One may conceive it to be the beginning of a croupous pneumonia, but finds nothing in the lungs. There is no definite evidence of any grave disease any-

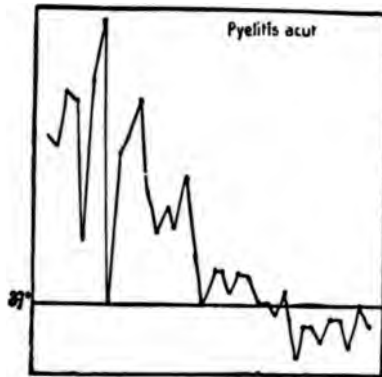


FIG. 20.—TEMPERATURE CURVE IN ACUTE PYELITIS.

where, either at the first examination or upon any following day. One thinks of osteomyelitis, otitis media, meningitis, but generally dismisses each of these suspicions. The infant grows steadily worse, the appetite completely fails, and the face assumes a dull yellow pallor.

Finally, the urine is cloudy, either with a diffused cloudiness or with a turbidity due to innumerable flakes. It is acid in reaction. If filtered, it gives on addition of acetic acid and potassium ferro-cyanide solution, a slight cloudiness. If it is centrifuged and examined microscopically it shows numerous pus cells,

entire nests of bacteria, blood corpuscles, a large quantity of pavement epithelium from the bladder and urethra, caudated cells from the renal pelvis and, frequently, casts.

If suitable treatment is begun, the fever drops in three or four days to normal, the appetite returns, and the general conditions improve; but the purulent contents of the urine persist, frequently for weeks.

If the diagnosis is not made, a certain portion of the cases die of uremia, or of complicating alimentary disturbance.

In another group of cases the severity of the infection diminishes, even without treatment, and finally

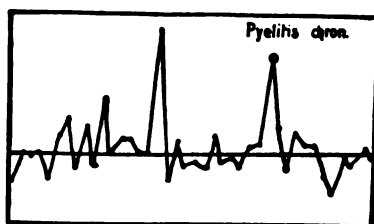


FIG. 21.—TEMPERATURE CURVE IN CHRONIC PYELITIS.

leads to a chronic condition. When the physician is finally called in, these infants show marked emaciation, great irritability, and give one the impression of a nutritive disturbance. Most of them have had either vomiting or diarrhea, at one time or another, in the course of the disease.

The treatment addressed to this supposed disturbance is without results. After a period of irregular temperature, the occurrence of a sudden high rise occasionally indicates that some other process complicates the condition. If, in the systematic examination of the infant, the urine is then examined, the pus is found.

The modus of these cases—whether the alimentary disturbance is primary and is complicated in its course by pyelitis, or whether it is an initial pyelitis, which leads secondarily to alimentary disturbance—is difficult to determine. In any event, it is well to examine the urine carefully when any rise of temperature occurs, whether the case is in hospital or in private practice.

Diagnosis.—The peculiar contrast between the severe constitutional symptoms and the very negative diagnostic findings should always lead one to suspect pyelitis. This is particularly true if the infant so affected is a girl.

To collect urine in a male infant, a test tube may be slipped over the penis and attached to the abdomen with adhesive plaster. In the female, a small wide-mouthed flask may be fastened over the vulva with adhesive plaster and the buttocks raised upon pillows. The legs are kept apart and are tied, in a fixed position, to the bed. Instead the infant may be placed upon a bed-pan, so that the buttocks extend into the pan and the legs may be fastened as described above. The infant is then given the bottle. It will usually void urine during the time of nursing, or shortly afterward. In the office, the girl infant may be catheterized under aseptic precautions.

If the urine is cloudy and shows an acid reaction, the probability is great that we are dealing with pyelitis. The diagnosis can only be confirmed by microscopic examination.

In order to demonstrate bacteria, the preparation may be stained with methylene-blue, or, better still, with methylene-green (pyronin). This gives a beautiful picture.

Prognosis.—The prognosis of pyelitis, if properly

treated, is good. Most cases recover. One must differentiate, however, between a clinical and an objective cure. The clinical recovery occurs early. It may be looked upon as an accomplished fact when pus is no longer found in the urine. This sometimes takes weeks and months.

In unfavorable cases, the infection may extend from the pelvis to the kidney substance proper. The albumin content of the urine becomes more abundant and the prognosis is not so good. These cases, however, also recover.

So far as the *prognosis for later life* is concerned, it should not be pronounced favorable without reserve. Cases do occur, in which upon the foundation of an old infantile pyelitis, relapses appear in later life, which, thereafter, continually recur. It has even been asked whether the pyelitis of infancy, by virtue of these recurrences, may not have some connection with the pyelitis of pregnancy.

Complications.—The most usual complication is in the direction of para-enteral disturbances. They commonly accompany a pyelo-cystitis.

The pathologic structural findings show a hyperemia, with some hemorrhage and ulceration of the pelvis or the kidney or the upper portion of the ureter. The kidneys very frequently show miliary abscess. The remainder of the findings at autopsy are relatively unimportant.

Treatment.—Urotropin, given in doses of 0.5 gram, four or five times daily, in a large quantity of water or weak tea or alkaline water, is very valuable. If the infant does not take fluids spontaneously, 200 c.c. may be given three times a day with a stomach-tube. Tepid compresses may be applied over the abdomen. The temperature generally sub-

sides after three or four days, when the compresses may be discontinued. Eight days later the dose of urotropin is reduced and is given but three times a day. This treatment, along with an abundance of fluid, is continued for three or four weeks.

If the urine still shows pus, fifty to one hundred c.c. of some mineral water are given three times a day, but no further treatment is required. The urine should be examined once a week. Salol, in doses of 0.2 gram, combined with a little sugar of milk and given several times a day, has proved of value. Vomiting, however, sometimes occurs after this remedy. At times, it is sufficient to strongly alkalinize the very acid urine by the use of sodium bicarbonate or potassium citrate. Doses of 0.5 gram, five times a day, are sufficient to give relief.

In place of the mineral water a weak tea may be used, made of flax seed, one teaspoonful to half a quart of water, boiled 10 minutes and then strained. Of this tea, one or two teaspoonfuls may be given hourly. Instead a tea may be made of uva urea. A cupful of boiling water being poured over one teaspoonful of the leaves. This is brought to the boiling point, and is then allowed to steep for ten minutes.

Irrigation of the bladder is useless, as it is only rarely affected.

Vulvo-vaginal Gonorrhea.

As with pyelitis, so gonorrhea affects almost exclusively the female infant.

Etiology.—The infection generally occurs during delivery of the mother affected with gonorrhea, or it is conveyed later in the handling of the infant, or it may occur by way of a gonorrheal conjunctivitis.

Epidemics of gonorrhea are dreaded in infant hospitals, particularly in the wards for female children.

Symptoms.—A purulent discharge from the vagina which leads to chafing, reddening and swelling of the labia, shows, on microscopical examination, leucocytes and intracellular gonococci.

Complications.—Gonorrheal arthritis, the pus in the joints, also showing gonococci.

Diagnosis.—Microscopic evidence of gonococci by staining with methylene green (pyronin) is essential.

In new-born infants, a sterile discharge occurs, in which, in some cases, staphylococci are present. If there is ulcer of the vulva, diphtheria bacilli are frequently found.

Prognosis.—So far as the general constitutional condition is concerned, prognosis is good. So far as ultimate cure is concerned, it is unfavorable. It seems almost impossible to make gonococci disappear absolutely.

Treatment.—Three times a day a small cotton pledget soaked in potassium permanganate solution should be inserted between the labia, pressed out and allowed to remain for fifteen minutes. Tannic acid baths (20 grams tannin acid to a bath) may be used, but are less certain to be effectual.

Along with this, protargol may be used in the form of suppositories. Such a suppository or an iodoform pencil may be inserted morning and evening. Bolus alba has also been used. This is placed in the vagina, three or four times a day, through a small ear speculum. After two or three days the vagina is irrigated with a soft rubber catheter and a normal salt solution (the Germans use Kamillentee), and then some more powder blown in.

In every instance, the discharge is extremely obstinate. On this account, vaccine therapy has been attempted. This may at times give good results, but it generally fails. A vaccine known as "arthrignon" may be used. Of this 0.25 gram may be injected two or three times a week in the gluteal muscles. The quantity of secretion, as well as the number of gonococci increase after the injection, but later on both decrease.

To treat gonorrhea until all the gonococci have disappeared would require months, and even then the result could not be guaranteed. In most cases one must be satisfied to bring about, as it were, a clinical cure, and must be content if the quantity of secretion is so diminished that the discharge only occurs now and then when the vulva has been left intentionally uncleansed for several days. Such a result can be brought about in the course of five or six weeks.

Arthritis gonorrhoeica is the only and most unpleasant complication of gonorrhea. It has a protracted course and is accompanied by high fever. The function of the joint affected is not permanently involved. The best result in the way of treatment is obtained by the use of the Bier pressure bandage. This may be left on for hours.

The External Genitalia.

Phimosis is a physiologic condition in the infant and does not require treatment. The idea that phimosis can be a cause of hernia is erroneous.

Preputial adhesions, that is, adhesions between the foreskin and corona of the penis, are always loosened in the course of time.

Hydrocele is found in nearly every male infant.

It disappears spontaneously at the end of the first year.

Balanitis and *vulvitis* are constantly recurring infections of the infant who shows manifestations of exudative diathesis. The condition is generally relieved by the application of cold compresses wrung out of an aluminum acetate solution.

DISEASES OF THE HEART IN INFANCY

The heart figure in the infant resembles a prone oval. The highest point of relative dulness is at the sternal end of the second rib. From this point it extends to the right, overlapping the sternal margin and extending to the para-sternal line.

The point of maximum apex impulse lies in the fourth intercostal space, one finger's breadth outside the mammillary line. The absolute dulness begins at the third rib, extends to the right as far as the left sternal margin and to the left somewhat beyond, but still within the left mammillary line. With increasing age, that is, at the period when the infant changes its position from the horizontal to the vertical, the contents of the thorax and abdomen descend somewhat, and the heart is included in this movement. This brings the apex of the heart lower and throws it slightly inward. The number of the heart-beats, in the first year of life, is about 130 in the minute. The pulse can be felt on the radial side of the arm. It is generally impossible to estimate its quality in the infant, and one must be content to determine broadly whether it is normal or abnormal. Many physicians, for this reason, are governed solely by the auscultatory findings of the heart. If one of the heart-sounds is heard faintly, or if it disappears entirely, some

heart weakness is present. Slowing of the pulse is observed in infants affected with severe alimentary disturbances, in the stage of decomposition and in birth traumata affecting the brain.

Heart lesions are so rare in the infant that they are of very infrequent recognition in the practice of the physician. Many of them are only discovered at autopsy, as, for instance, congenital hypertrophy of the heart, disease of the myocardium due to syphilis, etc. Only such as alter the entire habitus of the infant, e.g., pulmonary stenosis, accompanied by a pronounced heart-murmur, are diagnosed.

Accidental or functional heart-murmurs are found in cases which show a high grade of anemia. All other murmurs depend upon structural changes. Certain of these are caused by fetal endocarditis; others are due to defects of embryonal development. The possibility of analyzing clinically the several forms of congenital heart malformations is a limited one. It is permissible, therefore, in general, for physicians to content themselves with the diagnosis of vitium congenitum. The most common heart deformities are defects of the septum, and usually of the intraventricular wall. Next to these, comes pulmonary stenosis, which is quite readily diagnosed on account of the cyanosis that accompanies it.

Acquired heart disease does not occur frequently in infancy. In rare cases it manifests itself in an ulcerative endocarditis. In infants affected with fatal sepsis neonatorum, functional diseases of the heart play a much more important part than do structural defects. As these have been mentioned repeatedly, it will be unnecessary to discuss them again at this point.

DISEASES OF THE RESPIRATORY TRACT

The anatomic structure and functions of the respiratory tract exhibit certain differences from those of older children, and still more from those of the adult. The nares and the naso-pharynx are narrower, and therefore the breathing is more easily obstructed. The Eustachian tube is larger and favors the invasion of infective processes from the pharynx to the middle ear. The larynx occupies a higher position than in later life. The thorax normally maintains, in varying degree, the inspiratory position. The ribs extend horizontally forward from the vertebral column. The type of breathing is distinctly diaphragmatic. The respiratory rhythm is from thirty to sixty respirations in a minute. If dyspnea occurs, it is often not so directly dependent upon the involvement of the lung, as upon the condition of the heart.

To *inspect the pharynx*, the tongue spatula is introduced far back, so that the swallowing reflex is excited. This permits a momentary view of the entire posterior portion of the mouth cavity.

For *percussion*, the child is set upon a table, while the mother holds its arms in front of the child and bends its head somewhat forward, thus curving the back. The percussion is then made as in the adult, only more gently and without the use of the pleximeter or hammer. At times percussion by the palpation method and with one finger is feasible. To percuss the anterior portion of the thorax, the child is placed upon its back.

In the same positions, *auscultation* is carried out. If the infant is very restless, the mother may take it upon her arm, which makes the examination easier. A good stethoscope with a small bell is preferred.

The lower lung margin in the infant lies anteriorly within the mammillary line at the level of the upper margin of the sixth rib; posteriorly, it lies at about the line of the tenth dorsal vertebra. Auscultation and percussion signs are to be interpreted as in the adult.

The diseases of the respiratory tract in infancy come next in importance to alimentary disturbances. They occur in every month of life, and if they seem to affect the new-born less often, this is not on account of a natural immunity, but because the infant at that age is less exposed to infection than at any later period.

Etiology.—The cause of most of the respiratory diseases is an infection by various micro-organisms, e.g., the influenza bacillus, pneumococcus, micrococcus catarrhalis, staphylococcus, more rarely streptococcus, and diphtheria bacilli. There is no one specific micro-organism which serves as a causative factor. For this reason, the entire class of infections has been grouped under the name of la grippe. They occur more frequently during inclement weather, and often develop small epidemics. In the form of a household infection, they sometimes attack every member of a family. The disease is usually introduced into the family by the adults. They are affected with coryza or pharyngeal catarrh, but do not suffer any great discomfort from its effects. Similarly, in infant hospitals, a la grippe infection is commonly transmitted by adults, as physicians or nurses. They continue their service in spite of a coryza, and in this way infect the children. Transmission from bed to bed plays a minor rôle. A particular predisposition to such disease is found in infants affected with an exudative diathesis or rachitis.

Clinical Manifestations.—The clinical symptoms vary with the virulence of the infection, the locus of the inflammation and the constitution of the infant, and, of course, not least with the method of treatment.

In some infants the symptoms remain mild and recovery takes place as a matter of course. In other cases, however, the disease is fatal. In the one class the affection localizes itself in a small, circumscribed area of the respiratory tract. In the other, the malady is progressive. Beginning with an apparently inconsiderable coryza, it extends rapidly to the pharynx and trachea, eventually to the bronchi, and then develops a capillary bronchitis which is easily fatal. What form of development a la grippe infection will take is difficult to determine in advance, and for this reason any form of it, even the most harmless coryza, should be promptly treated. This is particularly true in the premature or rachitic infant.

Nasopharyngitis.

After a brief period of incubation, the infant becomes ill, showing restlessness, slight temperature, obstructed nasal breathing, and sneezing. The following day the nose discharges a clear watery secretion, and the glands behind the sterno-cleido-mastoid become swollen. After a further day or two, the temperature declines, the secretion from the nose becomes thick and more abundant, and the nasal orifices and the upper lip are excoriated. The nasal breathing is entirely obstructed. The respiration, in consequence, becomes audible and more rapid. A few days later the secretion subsides, the general constitutional symptoms improve, and the coryza and rhinitis may be said to be in the stage of recovery.

The real seat of the infection is not visible. It is

the naso-pharynx. Autopsy findings have shown that there is an enormous amount of secretion in these cases. If the anterior portion is principally involved, the coryza is more pronounced; if the posterior chamber, the secretion flows down the posterior pharyngeal wall.

In the latter event, the so-called pharyngitis or angina pharyngea develops, and the course is similar to the one described. Fever, irritability, anorexia and obstructed nasal breathing are noted. The nose, however, is free of secretion and there is very little to be seen in the pharynx. Redness of the uvula, at the angle of the jaw, and of the posterior pharyngeal wall is marked. The posterior cervical glands are rather markedly swollen.

This is an important finding as regards diagnosis. With the decline of the fever, the first two or three days, a yellowish purulent secretion will appear on the posterior pharyngeal wall which will flow from above downward. Simultaneously some cough appears. In every case, whether it develops as a coryza and pharyngitis or with the manifestations of la grippe, the infection will disappear in the course of eight or ten days.

Complications.—Frequently alimentary disturbances occur in connection with these affections. Anorexia, vomiting, difficult nursing on account of the obstructed nose, arrested gain or marked decline in weight follow. This is particularly true if the infant has been fed on carbohydrate-rich food mixtures. A severe parenteral alimentary disturbance, accompanied by mucous diarrhea, or even bloody, purulent stools and severe loss of weight, is a matter for treatment. This complication may be infinitely more severe than all the catarrhal manifestations in the naso-pharynx.

It is looked upon as a gastro-intestinal form of la grippe.

A prolonged fever of remittent type is often caused by enlarged and tender posterior cervical glands, which may suppurate (glandular fever, Drüsenfieber).

Still more unpleasant complications are *otitis media* and purulent *meningitis*. In premature infants, attacks of asphyxia may occur.

The *diagnosis* is not at all difficult, if one is reasonably familiar with the disease picture. One is only too readily inclined to assume that the severe constitutional disturbance and the high fever which frequently accompany it, do not result from the pharyngeal catarrh alone, but must be due to some other masked infection. This, however, is not necessarily the case.

A very good indication as to the probable seat of the infection is found in the palpable cervical glands (see p. 187). If the catarrh is particularly aggravated, careful examination should be made for diphtheria bacilli.

The *prognosis* is good. It is doubtful only in the case of a premature infant.

Treatment.—As a *prophylactic measure*, infants should be kept from contact with persons who have a cold. If the nursing mother or wet-nurse is affected with coryza, she should tie a cloth over the nose and mouth before putting the infant to the breast. If the nurse or nurse-maid is inclined to recurrent pharyngeal catarrh, it were better to dismiss her. The prophylactic attempt to harden the infant by the systematic use of cold water applications is unnecessary, and may be harmful. There is no reason why infants should not be taken out of doors during all kinds of weather and during the winter.

The best *therapeutic measure* in a pronounced naso-pharyngitis is the hot pack. The infant is placed in a hot bath of 38° C. (100° F.). Just before it is taken out, cold water is poured over its chest, in order to cause a deep inspiration and some cough. It is then placed without drying into a warm bath-towel. A woollen cloth is wrapped over this, and the infant is put to bed. Hot water bottles are placed at the feet and along both sides, and the infant is covered with an additional blanket. It is given hot water or weak tea by the bottle, and is allowed to remain in the pack for one hour. Most infants go to sleep during this procedure. After an hour it is taken out of the pack, thoroughly dried, and dressed in warm clothing. The hot pack is given morning and evening for a period of two days.

By this method the course of the pharyngitis is decidedly shortened and complications are avoided. After two days the catarrh is generally loosened. If some cough occurs at that time, a little liquor ammoniæ anis. may be given, in doses of three drops every two hours, in some milk or in an expectorant mixture. It is well to give warm drinks frequently for a few days. For the irritable cough which persists and typically occurs principally at night, codein preparations may be used just before bedtime.

It is well not to give the codein to infants either too young or premature. In these cases, if the cough is moderate, a warm, moist compress is usually sufficient, but if the cough is very troublesome and disturbs the infant's rest a great deal, chloral hydrate or urethane may be used morning and evening (chloral hydrate, 2 per cent. solution, dose one to two teaspoonfuls, or urethane, 5.0 gms.; sirup simplex, 100 gms.; two doses of one teaspoonful each).

In every case it is advisable to treat the nose and the pharynx locally. With the infant on his back, peroxide of hydrogen is dropped into each nostril. This cleanses the nares of the secretion. After they have become quite permeable, a zinc sulphate solution ($\frac{1}{2}$ per cent.) may be dropped into the nose from a teaspoon or pipette. This removes the mucus which accumulates in the pharynx and causes inflammatory changes there. The nose is finally well lubricated with some bland ointment or oil, such as borated vaseline or albolene.

Irrigation of the nose is not dangerous. Experience has shown that the secretion hardly ever enters the Eustachian tubes in this procedure. Nevertheless, it is well to fix the head of the child in the mid-line. Some care must be used in the use of hydrogen peroxide in overfed infants (status lymphaticus), as in the nervous infants and those affected with spasmodophilia. The same is true of the use of the menthol pack or menthol ointments.

Otitis Media.

One of the most serious complications of pharyngitis in the infant is otitis media. Infections of the middle ear occur, as otitis media concomitans, in atrophic infants. They may run their course without fever or suspicious sensation of pain. One discovers some morning that one or both ears are discharging.

Occurring in a normal infant, it often takes the following course. The infant is merely more restless than usual; it sleeps badly during the night, but in the morning again appears bright, when otitis media with very abundant secretion has manifested itself.

If an otitis occurs in the course of la grippe infection, it is usually, although not always, announced

by a renewed rise of temperature and by spontaneous pain in the ear and a corresponding restlessness. There is some tenderness over the tragus if the infant is touched during the bath or in the course of examination. Inspection of the drum membrane only gives good results in the hands of the trained observer.

A wet compress wrung out of aluminum acetate solution is applied. If there is no fever, it is sufficient to drop a little warm (10 per cent.) solution of carbolic acid in glycerin into the auditory canal and then to close this lightly with a cotton tampon.

If there is high fever, pronounced tenderness, and a definitely bulging drum membrane, it is best to do a paracentesis, or to attempt to produce perforation by the application of hot poultices or by irrigations of the ear with warm solutions. If rupture has occurred, small strips of gauze may be introduced into the auditory canal to absorb the pus. After eight days these tampons may be discontinued. Hydrogen peroxide is now dropped into the ear three times a day, and after eight days the mother may irrigate the ears morning and evening with a boric acid solution. (In Germany, Kamillentee is used.) This treatment may be continued until the secretion ceases. If the tampon is colored green from the bacillus pyocyaneus, carbolized glycerin may be used temporarily.

The moment that redness appears behind the ear or that the mastoid process becomes sensitive to pressure, the case should be referred to an ear specialist. The duration of the secretion from the auditory meatus is from four to six weeks. Frequently, however, it continues for a longer period.

Nasal Diphtheria.

If coryza persists in the infant, in spite of all treatment, it is advisable to examine the nose care-

fully for diphtheria bacilli. It will frequently be found that a nasal diphtheria exists. If, however, the first bacteriological examination is negative, a second, third, or even fourth examination may give a positive result.

Clinically, nasal diphtheria appears as a simple, but very protracted coryza. Frequently, only one side of the nares is involved. The secretion is profuse and of purulent and often hemorrhagic quality. The diphtheria need not have any other localization. In some cases, its course is run without fever; in others, it is irregular and of more or less high temperature.

Nasal diphtheria, like the other grippal infections, occurs in limited endemic form and may be carried by the adult, as, for example, by the physician or the nurse, into the hospital. It is an unpleasant affection, in so far that it is very difficult to free the individuals from the bacilli.

Treatment.—Six hundred or a thousand units of antitoxin are given intermuscularly. The muscular injection is difficult, but is absolutely necessary. In those cases in which a secretion containing only diphtheria bacilli exists, irrigation with hydrogen peroxide is good. If there is pronounced swelling of the diphtheritic membrane, tampons soaked in adrenalin solution or in silver nitrate solution (1 per cent.) may be placed in the nares and expressed. It is very difficult to remove the diphtheritic membrane, which may completely obstruct the nasal passages and interfere with the nursing. The membrane seems to have a tendency to adhere tenaciously, even after the antitoxin has been injected.

Recently the use of the antitoxin locally has been advised. Serum, in the dose of 4,000 units, is mixed with physiological salt solution, one to twenty-four

parts, or it is dissolved in fifteen parts of 10 per cent. carbolic acid solution, and is then introduced into the nares. If the membrane begins to loosen after a few hours the shreds may be washed out of the nose with another application of a fresh solution of antitoxin. This treatment is reputed to effect a cure after one or two days.

Tonsillitis rarely occurs in the infant. Acute laryngitis is more frequent and manifests itself in hoarseness, in a barking rough cough, and rattling breathing. The same manifestations are found in pseudo-croup, or laryngeal diphtheria, and in somewhat modified form in tracheal stenosis due to hypertrophy of the thymus.

As *laryngismus stridulus*, a harmless rattling sound is described, which manifests itself in some infants if they are excited pleasurably or otherwise. It always disappears during sleep and needs no special treatment. Tracheitis is always combined with laryngitis.

Bronchitis.

Bronchitis begins an acute course with a temperature of three or four days' duration. It is accompanied by a coarse, irritable cough, rapid breathing, audible wheezing, and râles within the chest. We do not have the serious constitutional symptoms which accompany pharyngitis of severe degree.

Examination of the infant will show a reddened pharynx. During the paroxysms of coughing, a grayish white viscid sputum, which later on becomes looser and foamy, appears in the throat. The lung resonance is normal. Upon auscultation, dry crepitant râles are heard either diffusely or over certain limited por-

tions of the lung. There is some retraction of the diaphragm, but no real dyspnea.

After three or four days, the fever declines, the cough is more pronounced and freer and numerous coarse and fine râles are heard over the lungs. In the course of some additional eight days, the disease subsides, the appetite returns, the bronchi are cleared. Only in untreated cases, and in those with spasmophilic tendencies, a cough remains, often distinctly spastic or paroxysmal in type, as in pertussis, and occurring preferably at morning and night.

The *diagnosis* must exclude pertussis, but it never has the acute onset that bronchitis has.

The *prognosis* is generally good. It may be serious in two directions, namely, in its tendency to extend either to the finer bronchioles or to the alveolar spaces.

Treatment.—The treatment of bronchitis, during the first few days, consists mainly in the use of hydrotherapeutic measures. The infant is given a hot bath daily in the morning and evening, followed by a cold douche and subsequently by hot pack (as described above). During the day, compresses are applied around the chest; a linen cloth or muslin, of several layers of thickness, being wrung out of tepid water (150° C.) and wrapped about the chest, extending from under the axillæ down to the umbilicus. A wide woolen cloth or flannel binder is placed over this and fastened with safety-pins. Every time the pack is renewed, the infant is given drinks of warm water or weak tea. So soon as the catarrh begins to loosen, expectorant mixtures should be given. Senega root, squills, or syrup of ipecac may be used. If the expectoration is scanty, apomorphine may be employed.

The bronchitis usually disappears in about eight days. If a cough remains, a warm moist compress may be continued at night and a small dose of codein in syrup may be given.

The infant should generally be kept indoors during the catarrhal stage. It is not necessary that it be kept in bed; in fact, this may not be desirable. On the contrary, it is well to carry the child about and change its position frequently. This counteracts any tendency to hypostatic congestion. If the weather is favorable, it may be taken out of doors, even during the acute stage. If the air in the room is very dry, wet cloths may be hung over the stove or the radiator, or steam inhalations may be given.

Capillary Bronchitis.

If the catarrh of the bronchial mucous membrane extends to the finer ramifications of the bronchial

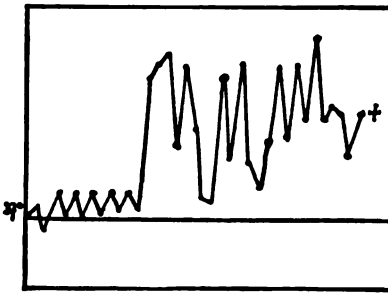


FIG. 22.—CAPILLARY BRONCHITIS IN CARBOHYDRATE DISTURBANCE.

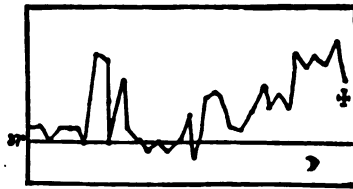


FIG. 23.—CAPILLARY BRONCHITIS IN A PREMATURE INFANT.

trees, a tendency to which infancy predisposes, capillary bronchitis develops. It gives a disease picture which, in severity and apparent hopelessness, is comparable only to the alimentary intoxications.

Capillary bronchitis seldom develops of its own accord. It is rather the finale of a progressive in-

fection of the upper respiratory passages which begins with coryza and extends eventually into a capillary bronchitis, or it develops on the basis of a subacute and neglected tracheo-bronchitis. The extension of the inflammation to the bronchioles is accompanied by a marked change in the general constitutional status of the infant. The change takes place suddenly. One immediately gets the impression that something has happened. The infant is paler than before and markedly prostrated. Severe dyspnea is apparent. The *alæ nasi* move with the breathing. The cough is spasmodic and sounds as though the entire chest were filled with secretion. At the same time the temperature rises. The disease reaches its highest degree in the rachitic infant. Its soft thorax is deeply retracted with each inspiration. The rachitic, premature and very young infants, those suffering with florid measles or who have just passed through an attack, and those affected with pertussis, are particularly disposed to capillary bronchitis.

Upon examination, the *objective findings* are often very slight. The thorax is held rigidly, in an extreme inspiratory position, but it is resonant throughout. In auscultation, fine crepitant râles are heard over the entire lung. At times, nothing is heard; the respiratory sounds seem very faint or almost absent, and only over the posterior lower portions of the lung some fine crepitant râles are discerned. Upon inspection of the throat foamy sputum is observed. If the paroxysms of cough are severe and if the disease has existed for some time, this will accumulate in the throat and appear at the mouth and nostrils.

At *autopsy*, the parenchyma of the lung is generally found to contain air, but the minute bronchi are entirely occluded by a purulent secretion. If a por-

tion of the lung is compressed, small pus droplets will appear all over the cut surfaces. Secondary changes are found in the form of an infiltration of the lung tissue and atelektasis.

Prognosis.—The prognosis is bad. The disease is usually fatal in the course of a week, and sometimes even earlier. In comparatively rare cases, recovery occurs.

Diagnosis.—Capillary bronchitis can hardly be mistaken for any other condition. In older infants one might suspect severe pertussis or an ascending diphtheria.

Treatment.—The treatment in all cases should begin with a mustard pack. There is no doubt that by this measure an unpleasant capillary bronchitis may often be aborted (see p. 171).

After the mustard pack, the skin should be tinged a deep red. This hyperemia, which often remains for days, has an effect similar to that of venesection. It withdraws blood from the pulmonary areas in which it has become abnormally congested.

If the infant does not begin to cry when it is placed in the mustard pack, the latter should be immediately removed. The prognosis in such a case is very bad. If the skin shows no reaction to the influence of the mustard and remains pale, one should resort at once to the use of camphor and caffeine. In general it is good practice to give an infant who shows some cyanosis a hypodermic injection of camphorated oil before he is placed in the pack.

If the infant reacts well, the mustard pack may be repeated daily or every two days, so long as the skin tolerates it. The infant is not dried after the mustard pack, but placed in a warm bath, then rubbed with a warm bath-towel and wrapped in blankets in

order to cause it to sweat freely. After it has done this for an hour, it is dried and dressed in warm clothing. Aromatic baths (see p. 171), or the hot bath, with cold douche following it, are at times useful. All of these measures aim to stimulate the child and to bring about deeper respiration. The lung passages are thus aërated and the blood is abstracted to a degree from the pulmonary vessels to the cutaneous areas. Venesection may be carried out even in very young infants, and 30 c.c. of blood may be taken without difficulty. The blood generally clots very quickly in infants.

Temporary relief from *severe dyspnea* is sometimes afforded by the use of oxygen inhalations. The funnel is placed over the mouth and nose of the infant, and a dilute stream of oxygen is allowed to pass. It may be given for a period of ten minutes every hour. Belladonna or a preparation of atropin is often very serviceable in these cases. By frequently changing the infant's position or by taking it into the open air, hypostatic congestion may be prevented.

If *asphyxic attacks* occur, due to the abundant secretion, the thorax may be compressed rhythmically and vigorously with both hands. This expresses the secretion from the lung as though one were squeezing out a sponge. The secretion will appear at the mouth and nose. The maneuver of Schultz may also be used and will sometimes give relief. If the secretion is very tenacious and scanty, apomorphia should be used, or a mixture of ammonium acetate or ammonium chloride in a suitable vehicle. The use of steam inhalations or steam spray is also very beneficial.

Stimulants should be given from the very beginning. Caffein or digitalis may be used. If acute heart failure is threatened, camphor or caffein should be

given subcutaneously. In certain cases, especially in older and very restless infants, narcotics are beneficial. Morphin may be used subcutaneously, or enemata of chloral hydrate may be given by rectum, or urethane by the mouth. The prolonged use of narcotics is not desirable.

Emetics are not reliable. They may be used so long as the infant is in fairly good health; among them wine of antimony. If vomiting actually occurs, large masses of mucus may be expelled from the respiratory tract. Frequently, however, vomiting does not follow, and the emetic will then cause only an unpleasant diarrhea.

With any of these therapeutic measures one must begin early in the course of the disease, when they give the greatest likelihood of result. Later on, therapeutic measures are apt to fail.

A large proportion of infants attacked succumb; a much smaller percentage recover; and still, in a third group, the general conditions are relieved, but localized areas of disease often remain for weeks and arouse the suspicion that bronchiectasis has resulted. These latter cases are most favorably influenced by fresh air, by the use of warm baths, with cold douches, given daily, and by the use of cod-liver oil with creosote internally (creosote, 1.0; cod-liver oil, 100.0; dose half a teaspoonful, three times daily).

Pneumonia in Infancy.

The form of pneumonia familiar in infancy is broncho-pneumonia (catarrhal, lobular). This occurs most frequently during the first, second, and third years of life; in later childhood it is less common.

The most common form is the paravertebral (hypostatic) pneumonia. This very frequently accom-

panies a severe alimentary disturbance in infancy. A rarer form is the croupous lobar pneumonia. It does not occur prior to the last quarter of the first year of life.

Broncho-pneumonia.

Broncho-pneumonia is characterized by the occurrence of disseminated small and, at times, confluent consolidations of the lung tissue. It is accompanied by an irregular fever, running at times high; then again falling low, but without definite curve. The disease generally develops upon the basis of a catarrhal process of the upper air-passages, the nose or the pharynx, or is sequent to inflammations occurring in the bronchi and bronchioles. A predisposition to it is evident in cases of measles or pertussis, and under the inadequate lung ventilation of rachitic infants.

Symptoms and Course.—Subject to its mode of origin, the earlier symptoms of broncho-pneumonia may suggest a favorable interpretation. They generally indicate a disease of the respiratory tract in general and frequently begin with such mild concomitant symptoms that one is surprised to find a broncho-pneumonia present early in the examination of the lung. Again, in other cases, the constitutional symptoms are very severe. The fever runs high, but although one searches for a pneumonia, one fails to find it. Only bronchitic manifestations appear. After three or four days, however, the original assumption that pneumonia was present is sustained and the disease may then be demonstrated.

The seat of broncho-pneumonia is preferably in the posterior dependant portion of the lungs. With the child continually occupying the dorsal position, this is the part of the lung which has the least ventila-

tion. The fever is of a remittent type, often reaching the danger-point of over 40° C. (104° F.), but with no other definite characteristics.

The frequency of breathing may also show a marked increase. The child's general condition is frequently grave. Again, in other cases, the infant shows no particular inconvenience, even though the process is extensive.

The criterion of constitutional conditions is generally found in the state of the heart. So long as the heart is intact, profound dyspnea and marked prostration are not apt to occur. Cough may be present, with anorexia and restlessness. In severe cases, there is slight somnolence and delirium, retraction of the head, and convulsions may follow.

The *percussion note* may not be changed. This is not to be wondered at, if one considers the small area of lung tissue which is involved. Nevertheless, even in those cases in which direct percussion seems to show normal conditions, one gets the impression that by direct percussion with one finger, an increased resistance may be felt. Through the confluence of a number of distinct areas the percussion note will be altered and a definite field of dullness may be found.

Auscultation frequently shows nothing more than circumscribed areas of bronchophony. This is particularly true when the infant coughs or cries. If the disease continues for some time, these will eventually assume a bronchial character. In most cases, however, a definite bronchial breathing, either pure or accompanied by fine crepitant râles, is heard. The extent of the findings depends entirely upon the area of congestion present in the lung, which is found preferably, as noted, in the posterior portion of the

lower lobe. Such areas, however, are also found in the apex and in the anterior portion of the right lower lobe. Rarely are they discovered in the upper lobe.

Broncho-pneumonia generally disappears much the same as it appears. In most cases the prognosis is good; in some, it is fatal. Often its course is protracted and leads to chronic pneumonia. This often extends over several weeks, but is interrupted by

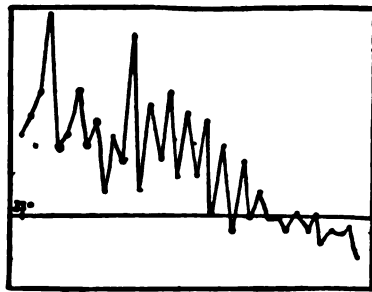


FIG. 24.—TEMPERATURE CURVE IN BRONCHO-PNEUMONIA.
37° C., or 98.6° F.

occasional short exacerbations accompanied by variable temperature.

The *diagnosis* of broncho-pneumonia depends upon the lung findings. In chronic pneumonia, one must think of tuberculosis, to the extent of employing the Pirquet reaction, or of congenital bronchiectasis. Multiple abscess formation, favored by the pneumonia of infancy, will cause similar auscultatory findings.

The *prognosis* depends upon the general prior health of the infant. If one has to deal with a vigorous child, it is favorable, even though the process is very extensive. In the infant with alimentary disturbance, or in one affected with rickets or with measles or pertussis, it is doubtful, even though the area involved and the lung changes are considerable.

Treatment.—The initial rôle, as in all respiratory affections, is played by hydro-therapy. A warm bath may be given, morning and evening, followed by a cold douche. If there is any inclination to circulatory weakness, as shown by cyanosis, coldness of the extremities or the tip of the nose, brief hot baths should be employed, at 38° to 40° C. (100° to 104° F.). Should there be marked restlessness and high fever, the water may be made cold after the infant is placed in it and the bath may be extended somewhat in order to depress the fever and induce sleep. To influence the fever, in a protracted course of the disease, quinin has been used, as well as some of the coal tar preparations, e.g., pyramidon or aspirin.

In the intervals between the baths, in weak and atrophic infants, warm compresses may be placed about the chest and changed every two hours. Senega or apomorphia may be given internally. If its general condition will permit, the infant should be carried about, or should have its position changed frequently. The food should be reduced to one-half its usual quantity if the infant does not of its own accord refuse nourishment, and in place of the food, water or weak tea should be given freely.

If improvement is had in a few days the temperature falls and the stasis in the chest begins to resolve. Narcotics may be given, in place of expectorants, in order to favor absorption. Morphin or codein preparations may be used. It should be noted that in the acute stage of pneumonia these drugs are not indicated; they should be used only when the crisis has passed. After the lung symptoms have entirely disappeared, it is well to give cod-liver oil, with some creosote, for a period of several weeks (see p. 297).

If the course of the disease differs from that de-

scribed, it may be necessary to use the customary expectorant mixtures, such as ipecac, ammonium chloride, etc.

If there are circulatory disturbances, the same treatment should be carried out as has been described in the section on bronchitis. The serum treatment has proved so far of no value.

Para-vertebral Pneumonia.

This form of pneumonia is different from all other forms of inflammation of the lungs, in its primary localization and seat. It is found in the posterior portions of the lung parallel to the vertebral column and hence is called para-vertebral pneumonia. It extends in streaked areas through the lung from the apex to the base.

According to the investigations of Bartenstein and Tada, at Czerny's clinic, these pneumonic areas are of a circulatory origin; they develop from hemorrhages occurring in the parenchyma of the lung. These occur, at first only here and there in individual alveolar groups, which by confluence become enlarged and extend into the hypostatic areas which can be recognized microscopically. Bacterial infections or inflammatory pneumonia do not seem to play a rôle. As a causative factor the bacterial infections always take a secondary place.

Severe illness and the maintenance of the dorsal position of the infant favor the occurrence of para-vertebral pneumonia. For this reason it is an almost constant accompaniment of severe acute alimentary disturbances.

Clinically there are few symptoms. Only in case the infiltration has continued for a long period is there an increased resistance to the percussion finger

and some dullness. Upon auscultation, a fine crepitation is frequently heard with inspiration.

The condition is chiefly diagnosed by inspection. The infant shows peculiar configuration of the thorax, the so-called raised thorax. An abnormal arching of the chest in its upper anterior portion is seen at about the level of the junction of the manubrium with the corpus sterni.

Para-vertebral pneumonia never occurs distinctively, but is always a complex of some other disease process and, therefore, its *prognosis* depends upon the fundamental disease.

The *treatment* to be used guards against the heart weakness and is carried out according to rules laid down in the chapter upon the therapy of acute alimentary disturbances.

Croupous Pneumonia.

Croupous pneumonia is rare in infants and first occurs toward the end of the first year of life. It begins with acute, continuous high fever. On the fifth to the seventh day, or even later, the crisis occurs and the temperature goes down to normal.

A large circumscribed area of lung is involved, but it does not usually involve the entire lobe, as in typical lobar pneumonia. The right upper lobe is preferably involved. Among other symptoms, convulsions, opisthotonus and other cerebral manifestations have been observed. More frequently than one thinks, a so-called central pneumonia is present. In this event there are no auscultatory or other findings. The Röntgen ray shows, however, the defined infiltration, sometimes reaching as far as the periphery. Only after three or four days will typical bronchial breathing be heard in the axillary region.

The *treatment* of croupous pneumonia is the same as that for the catarrhal form.

The *prognosis* is good.

Diseases of the Pleura.

The pleura is involved independently, or as a sequence to, or an accompaniment of lung inflammations. Fibrinous, serous, sero-fibrinous and purulent pleuritis, the so-called empyema, is found. It occurs more frequently in infants than in older children.

Empyema is frequently secondary to a pneumonia. The symptoms are the same as those in later life. Extensive dullness, increased resistance, at times slight edema of the skin are signs of the effusion. Indistinct or absent breath sounds, absence of fremitus in the triangle of Rauchfuss, displacement of the heart, a dilatation of a part of the thoracic cavity causing obliteration of the intercostal spaces, are characteristic.

Frequently small multiple, encapsulated empyemas are found. More commonly, however, the larger, individual cavity filled with pus is observed. The fluid does not extend to a high point parallel to the vertebral column, reaching the highest level in the posterior axillary line. At this point, paracentesis should be made in the sixth or seventh intercostal spaces. A thick, short cannula should be used, to which a Record syringe, holding 10 c.cm., should be attached. The paracentesis may be performed, also, with a dull trochar. If pus is present, it must be removed immediately.

Only some empyemata are absorbed spontaneously, that is, become organized. The pus may be removed by repeated paracentesis or by resection of the rib.

AFFECTIONS OF THE ALIMENTARY TRACT OTHER THAN ALIMENTARY DISTURBANCES

Thrush.—In every infant, even though it be entirely normal, thrush fungi are found in the mouth, but they do not begin to proliferate until the infant becomes ill. They then form colonies which are microscopically visible and which cover the entire mouth cavity with a dense exudate. The occurrence of thrush is always a secondary manifestation, and, for this reason it does not require treatment, since it disappears when the primary disease responsible for it has disappeared. Its development is favored by lesions of the mucous membrane produced by wiping out the mouth. This procedure should be absolutely forbidden.

If one must do something to pacify the parents, one may dust a strip of gauze with powdered boric acid, sweetened with saccharin, and allow the infant to suck on this pledget; or, instead, a local application of sodium bicarbonate may be made, several times a day, to the tongue and the mouth surfaces.

If *gingivitis* and *stomatitis* are also present, the mucous membrane of the jaw, the buccal surfaces, the gums and the tongue may be painted with a solution of equal parts of tincture of ratanhia and tincture of myrrh.* The aphthous vesicles of stomatitis may be painted, once a day, with a 1 per cent. solution of silver nitrate. Boric acid powder, or a mixture of iodoform and boric acid powder, in equal parts, may then be applied to the mucous membrane.

Under the term *Bednar's aphthæ*, ulcerations are described which occur at the angle of the jaw and

are usually due to injury of the mucous membrane by the finger-nail in roughly wiping out the mouth. Once they were commonly seen, but now, since the custom of cleansing the child's mouth in this way has been partially abandoned, they have become infrequent. Whenever the infant is said to refuse the bottle despite the fact that it is apparently very hungry, one must always look carefully for Bednar's aphthæ. The ulcers may be touched several times a day with a 1 per cent. silver nitrate solution, after which the infant should be immediately fed. The food should be warm.

The following *anomalies of the tongue* are observed. The so-called lingua geographica, which appears in infants affected with an exudative diathesis; the macroglossia, observed in the infants affected with mongolism or myxedema; and the "tied tongue," with too short a frenum. The parents frequently ask that the frenum be cut, because they fear that the infant will not learn to talk properly. A short frenum is never a hindrance to proper speech or proper nursing. One may always assure the parents absolutely that it is unnecessary to cut the frenum and that the infant will certainly learn to talk. If you have to deal with a child beyond the age of infancy, who really should be and is not able to talk, the short frenum is not the cause. In such a case, one always discovers an imbecile child or an infant who has had spasmophilic convulsions. The latter type of infant frequently talks at a late period.

The *anomalies of teething* have been discussed in a previous section of this book. The subject of certain peculiar changes in the eruption of the teeth has also been touched upon in the discussion of exudative diathesis and rachitis. A strikingly bad set of teeth, showing early caries, is found in idiotic in-

fants. Such pathological manifestations as fever, convulsions, etc., which tradition and the firm belief of the laity connect with teething, have no significance and no relation to it.

In infancy, ulcerative processes, similar to round ulcer, are found in the gastro-intestinal tract, notably in the duodenum and more rarely in the stomach or jejunum.

Invagination of the intestines is a terminal phenomenon and is frequently found at autopsy.

Anal rhagades occur in the form of radiating fissures of the anus. They are frequently observed in infants suffering from the effects of overfeeding with milk. The large hard stools characteristic of these cases cause abrasions and tears of the mucous membrane. They may be treated with a 1 per cent. silver nitrate solution. The food should be changed to a form (e.g., malt soup) which will make the stools soft.

Prolapse of the rectum results from severe tenesmus due to a prolonged diarrhea. If the condition of the stool is altered it will heal of its own accord. Frequent enemata have a favorable effect, in that the rectal ampula is emptied without the use of the abdominal muscles. If the prolapse has existed for some time, the buttocks may be brought together by an adhesive strap, which mechanically prevents its descent. Very commonly, infants affected with habitual prolapse are neuropathic individuals (Czerny).

Inguinal hernias are very common in infants, especially in the prematurely born. A large proportion of them disappear as the infant grows older, especially when it begins to walk. By the change of position from the horizontal to the vertical, the breech of the abdominal muscle is directed toward

the pelvis instead of toward the anterior abdominal wall. In atrophic infants, hernia frequently disappears so soon as some adipose tissue is deposited in the abdominal walls. Spontaneous healing is favored



FIG. 25.—WOOL-SKEIN USED AS A TRUSS.

if the hernia is retained by some sort of a truss. In the infant the wool-skein is very serviceable. A skein of wide woollen, about the size of the thumb, is placed around the abdomen of the child in such a way that the knot of it acts as a pressure pad. A free end is passed between the legs and united again to the woollen binder over the sacral region (see Fig. 25).

Hyperplasia of the Thymus.

With the beginning of extra-uterine life, the thymus gland approaches the end of its functional activity. It continually grows smaller from birth on, and finally disappears entirely at the age of puberty. In the new-born it completely fills the space behind the manubrium sterni and subsequently takes part in all the vicissitudes of the infant organism. If, for instance, an infant is overfed, it hypertrophies; but if a severe alimentary disturbance, or other wasting disease breaks down the tissues of the organism, atrophy occurs. . Hyperplasia of the thymus, together with enlarged spleen, swollen intestinal follicles and hypertrophied tonsils are found in the symptom-complex of exudative diathesis, termed the staticus lymphaticus. This is a condition of much practical significance, since infants so affected are subject to sudden heart failure, the so-called thymic death.

Enlargement of the thymus gland alone may occur congenitally. It is usually discovered accidentally, for it does not as a rule cause any clinical manifestations. A para-sternal dullness, extending to the left of the sternum and merging with the heart dullness is found. Increased breathing, almost bronchial in type, is heard over this area.

Only in special cases, however, does the persisting thymus lead to obstructive respiration. If it does, the infant shows a tendency to asphyxiation, sometimes immediately after birth, which is accompanied by a peculiar stridulous type of breathing. In other instances, these manifestations are absent, but in their place a considerable degree of stridor, a frictional type of breathing accompanied by a slight hissing sound, is observed. When the infant becomes excited, this is markedly aggravated. It never disappears en-

tirely, even during sleep. Under unfavorable conditions, as in the event of respiratory disease, it may lead to severe asphyxia.

If the hyperplasia of the thymus causes no inconvenience, it requires no treatment. In tracheal stenosis, the Röntgen ray treatment may be used. This frequently causes a distinct atrophy of the gland, with but one or two exposures, and a marked improvement of the symptoms follows. Surgical treatment of hyperplastic thymus is advisable.

DISTURBANCES OF THE CENTRAL NERVOUS SYSTEM PECULIAR TO INFANCY

The most significant and, from the layman's viewpoint, the most alarming symptom of disease of the central nervous system in infancy is convulsions. For practical purposes certain differentiations may be made.

1. *Organic convulsions*, of a symptomatic quality accompanying definite structural changes. Among these are reckoned convulsions which occur with all forms of meningitis (serous, purulent, tuberculous), with encephalitis, with hydrocephalus occurring in sclerosis and in congenital defects of the brain (porencephaly), and finally those resulting from lues and birth traumata.

2. *Functional or idiopathic convulsions*, for which at the present time, no anatomical foundations can be laid; among which are the spasmophilic type, the epileptic form, the convulsions occurring in infants suffering with functional alimentary diseases, e.g., alimentary intoxication, and the terminal convulsions of infants in extremis.

Of all convulsions, organic as well as functional,

the most frequent are those of spasmophilic type, which have been discussed in detail under spasmophilic diathesis (see p. 222).

Another peculiarity of infancy is the tendency to spastic conditions of the musculature. In the mildest form, it is met with as a hypertonic contraction in infants ill from carbohydrate disturbances or in neurotic infants affected with habitual vomiting. There are even infants, apparently normal, who show this peculiar rigidity of the muscles. Even if not observed at an earlier date, it is noticed when the infant begins to walk. It does not step firmly on the feet, but constantly attempts to walk on the toes. Later on, strabismus is a frequent symptom. Increased reflexes are also present. During the school period certain psychic anomalies are often discovered. These cases shade into those forms in which finer muscular spasms are present, as in hydrocephalus, microcephalus, Little's disease, etc.

Epilepsy.

Epilepsy occurs in infancy but with infinitely greater variety than in later years. One may make the diagnosis of epilepsy if, on the one hand, there are no definite evidences of structural brain disease, and if, on the other hand, spasmophilic symptoms are consistently absent. Epilepsy, however, is not dependent upon these negative findings alone, but shows definite, positive manifestations which differentiate it clearly from spasmophilia.

Epileptic attacks occur with equal frequency in breast-fed and artificially fed infants. They are not confined to any definite period of infancy, nor to any particular season of the year.

They affect infants even in the first two months

of life, a period during which, as is well known, spasmophilic manifestations do not appear. In departure, again, from spasmophilic attacks they may occur during the summer months. They develop without any apparent cause or insult, or any accompanying disease condition, as is infrequently true of the spasmophilic infant. On the contrary, one often notes that epileptic attacks cease during the run of any severe illness, i.e., measles, or severe alimentary disturbances.

Epileptic convulsions, in infancy, take an alternative course. In certain infants affected, the attacks occur at regular intervals, each day, or once a month, or once in three months. Sometimes, the seizures are all of the same severity, and again, they may become milder and gradually lead to the condition known as *petit mal*. Retardations of the mental faculties begins early. An epilepsy continuing in this manner uninterruptedly, finally leads the victim, while still in its infancy, into epileptic institutions.

In a second group of infants so affected a pause follows the first few attacks occurring in infancy, which may last for years. During this entire period the individual gives the impression of being perfectly normal. At school age, or at the climax of puberty, or even later, epilepsy develops anew and from that time on it does not entirely disappear.

The *prognosis* of epilepsy should always be very guarded.

In its *treatment* bromides are generally given (0.25 gram of sodium bromide, four times a day).

Hydrocephalus.

Hydrocephalus may be either congenital or acquired. It is characterized by the well known

progressive enlargement of the cranium due to a transfusion of fluid into the cerebral ventricles (hydrocephalus-internus), or into the cranial vault between the occiput and the vertex of the brain (hydrocephalus externus, or pachymeningitis hemorrhagica).

In comparison with the enormous enlargement of the cranial cavity, the development of the child's face seems strikingly small. The eyes assume a peculiar position; being directed downward, while the upper eyelid reveals a large part of the sclera. The psychic condition of the infant generally remains intact. The rest of the organism outside of the head is not necessarily involved, unless the volume of fluid within the cranium increases greatly, when severe spastic symptoms may develop. The entire body may become rigid, opisthotonus may appear, the hands and legs may become crossed and the reflexes be exaggerated.

The *prognosis* is not always bad.

At times spontaneously, or under the influence of treatment, the condition comes to a standstill and there seems to be a recovery. The enlargement of the head, however, always remains. In all cases of hydrocephalus, mercurial inunctions should be used, regardless of the outcome of the Wassermann reaction. It is well to attempt to reduce the volume of fluid within the cavity by repeated spinal puncture. This form of treatment is not infrequently followed by excellent results.

Idiocy.

Idiocy is not really a disease, *sui generis*, but is a sequential result of meningeal or encephalitic processes, or is due to traumata of the brain occurring during birth, or to anomalies or malformations occurring during fetal life. It is found, also, in certain

diseases which, according to our present conceptions, we regard as functional disturbances in glands of internal secretion. Such conditions are mongolism, myxedema, etc.

If an infant with well-defined idiocy is presented, one is frequently no longer able to determine the primary disease condition which has been responsible. Frequently, one has to be content to make the diagnosis of *vitium cerebri*.

The consequent idiocy may frequently be diagnosed very early. A normal infant is seen to notice objects, i.e., a watch or burning match held before it, as early as the third month. It fixes the object with its eyes and, if it is moved, the eyes follow. Idiots do not fix any object with the eye and do not reach for it when it is held before them. They have no sense of taste. This can be tried out by giving the infant first a teaspoonful of saccharin solution and following it immediately by a teaspoonful of quinin solution. The normal infant will take the saccharin solution readily, but will vigorously resist taking the quinin solution. The idiot, however, will take both and, at times, will reach for the quinin.

The pain sense is also diminished. This may be tested by pricking the skin with a pin or by pinching the toes. Toward the end of the first year, normal infants begin to articulate sounds other than those of crying. They may be trained to keep themselves clean and to control the passage of feces and urine. Idiots do not learn to speak until three or four years of age, and to train them in cleanliness requires a much longer period. The development of the static functions is very much delayed. Very few learn to sit up during the first year, or to hold up their head. They show a degree of salivation far exceeding the

physiologic. Many of them have macroglossia, constantly keep the mouth open and snore on account of the hypertrophy of the pharyngeal lymphatic ring. This is a symptom very commonly found in idiots. The tendency to deficient development of the brain is expressed in early closure of the fontanelle. Normally the fontanelle closes after the first year. In the idiot it is frequently closed by the sixth month. This leads to the development of microcephalus, or aztec-cranium.

Some of these infants are quiet and lead a simple life; they drink well and, as they are habitually content, they are not overfed. Consequently, they do not readily become ill and are generally in very good physical condition. They are of the torpid type.

Others, again, are idiots of the agile type. Such infants, with much motor unrest and with a habit of crying without motive and sometimes for hours, are a torture to their attendants. In such cases, muscular spasms, convulsive attacks and strabismus are frequently observed. Feeding also offers great difficulty. It is often impossible to give them any other food than milk.

The *diagnosis* of idiocy, in view of the multitude of symptoms it presents, may be easily made.

The *prognosis* is unfavorable.

The *treatment* is merely symptomatic.

Little's Disease.

By the term Little's disease we designate a high grade spasticity of the limbs observed in some infants which is often, although not always, accompanied by a marked impairment of mental function. The rigidity begins to appear soon after birth. Preferably it affects the legs and specially the adductor muscles of

the thighs. It is best demonstrated by holding the infant suspended. The legs are then crossed. Strabismus is practically always present. The reflexes are increased, convulsions are frequent, and idiocy is often present.

As *etiological factors* in the disease, the triad of parturient conditions outlined by Little, namely, the violent, the asphyxic and the premature birth, have been responsible. It is a fact that premature infants frequently develop Little's disease, but the several etiological factors mentioned do not fit every case.

Prognosis.—In later life, the rigidity of the extremities generally improves.

Treatment.—In infancy, the treatment is generally confined to frequent hot baths, which improve the spasticity somewhat. These baths are followed by careful massage. Later in life, the infant should be turned over to the orthopedist.

Myxedema and Mongolism.

In some cases, idiocy is due to a congenital myxedema. This type of infant may be recognized by the bloated, stupid face, the thick tongue, the saddle nose, the dry, desquamating skin, the myxedematous fat, the thin, coarse hair, the umbilical hernia, the chronic constipation and some of the usual symptoms of idiocy.

This type reacts promptly to the thyroid extract. Of this substance as much as 0.1 gram may be given daily, even to the youngest infant, without any harmful effect. The external habitus visibly changes under the thyroid treatment, but the intelligence of the infant never approaches that of the normal individual.

More frequent than myxedema is the condition of *mongolism*. In this form of mal-development, also, there are visible changes of the external habits. The

angles of the lids are very narrow and are slanted upward and outward. The inner canthus of the eyes shows a very pronounced development, the so-called epicanthus. There is also the saddle-nose, strabismus, malformations of the ear, short, stubby fingers and, frequently, congenital malformity of the heart.

The parents frequently do not notice these external abnormalities, but the thing that does strike them is the especially hypotonic condition of the musculature and the mobility of the joints, enabling them to move in any direction. The mongols are generally of hilarious mood. In later life, they furnish considerable amusement to their associates. They always show a certain degree of mental deficiency.

The *prognosis* for all of this class of infants is not very good. Most of them die in early childhood; very few live beyond the age of puberty.

Therapy consists chiefly in the administration of the thyroid extract, but it is generally without very much result.

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